A Re-Evaluation of the McKean Series on the Northern Plains

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Abstract

Interpretations of McKean are generally based on the large amount of data recovered from sites in the northern United States. McKean sites have also been identified throughout the Canadian Plains, but at present many of the studies associated with these sites have yet to be published. Of particular importance are detailed analyses of assemblages from a number of multi-component sites such as Redtail, Thundercloud, and EgNo-23 in Saskatchewan. Data from these and a number of similar sites are summarized to update the McKean record on the Canadian Plains. These studies offer new information with regard to McKean cultural adaptations, providing new insight into interpretations of McKean subsistence, settlement patterns, origins, and expansion. Furthermore, strong evidence exists for the stratigraphic and temporal separation of the lanceolate and stemmed projectile point varieties commonly associated with McKean. In light of such evidence, McKean is no longer representative of an archaeological complex and a taxonomic designation of archaeological series is preferred. This research provides an important first-step towards the re-examination of McKean and will have an impact on future interpretations of the McKean series throughout the Northern Plains.

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Finally, I would like to thank my wife Raelynne and my daughters, Paige and Hope. Words cannot describe my appreciation of your love, support, patience, and understanding.

This thesis is dedicated to my family. I finally made it.

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Chapter 1

Introduction

1.1 Introduction

McKean was first recognized as an archaeological complex in 1954 as a result of the investigation of the McKean site in northeastern Wyoming (Mulloy 1954). Excavations in the lower occupation revealed a number of stemmed and lanceolate projectile points (now known as McKean Lanceolate, Duncan and Hanna [Wheeler 1952, 1954]) that appeared to be in direct association. Mulloy (1954) considered each of these as variants of a single type; however, a number of other excavations (Wheeler 1995, 1996, 1997) revealed components that contained only one of these styles. As a result, Wheeler (1954) concluded that each of the variants was a different and recognizable type. Excavations at Mummy Cave (Husted and Edgar 2002), Pictograph Cave (Mulloy 1958), and Signal Butte (Strong 1935) revealed similar assemblages to McKean and, consequently, Mulloy's (1954) proposal that the points were variants within a single complex appeared to be justified. At the same time, similar stemmed and lanceolate points were recovered in both Saskatchewan (Wettlaufer 1955) and Manitoba (MacNeish 1958; Vickers 1949), and shortly after the McKean complex became widely recognized throughout much of the Canadian Plains (Syms 1969).

Early interpretations of McKean relied heavily on research from Wyoming (Frison and Huseas 1968; Husted and Edgar 2002; Mulloy 1954), Montana (Mulloy 1958) and Nebraska (Strong 1935) where projectile points were recovered in association with grinding stones and slab-lined roasting pits. Combined with evidence from faunal and floral remains, which indicated a wide and variable diet, it appeared that peoples of the McKean complex were utilizing a generalized subsistence strategy. Furthermore, these artifact assemblages shared many similarities to those from sites in the Great Basin leading to direct comparisons and ultimately the suggestion that the Great Basin may have been the original homeland for McKean (Jennings 1957). Later

excavations in Alberta (Brumley 1975) and Saskatchewan (Quigg 1986) revealed a much different picture of McKean. McKean assemblages in the Canadian Plains lacked evidence of an archaic adaptation (an adaptation focusing on the utilization of a wide variety of floral and faunal species) and faunal assemblages appeared to indicate a much greater reliance on bison (Brumley 1978). Furthermore, many of the occupations were associated with only one of the named variants supporting Wheeler's (1954) assumption that each of the points represented a different type.

Unfortunately the dichotomy between 'northern' McKean and 'southern' McKean has yet to be resolved. Much of this problem stems from the fact that while there is a relatively large body of published data from McKean sites in the United States, few examples exist for sites from the Canadian Plains. Luckily, recent excavations in Alberta and Saskatchewan have dramatically increased the McKean database from this region. For example, between 1993 and 1998 excavations at the Thundercloud site (FbNp-25) in Wanuskewin Heritage Park near Saskatoon, Saskatchewan revealed multiple McKean occupations. The subsequent analysis and interpretation of the Thundercloud material (Mack 2000; Webster 1999) outlined several problems with the current state of McKean research in the Canadian Plains. Other sites in Wanuskewin Heritage Park such as Redtail, Cut Arm and Meewasin have also revealed McKean components. The most impressive of these is the Redtail site (FbNp-10) with at least seven McKean occupations, of which four are associated with McKean Lanceolate points and at least three with Hanna (Ramsay 1993). The discovery and mitigation of EgNo-23 near Elbow, Saskatchewan added another sequence of three McKean occupations. Moreover, the investigation of EgNo-23 led to the discovery of the first McKean bison kill site in Canada.

While this new information is indeed impressive, researchers are still faced with a limited number of published resources for direct data comparison. Analyses by Brumley (1975) in Alberta, Quigg (1986) in Saskatchewan and Syms (1969) in Manitoba provide the basis for such comparisons, but are limited to a very small sample of sites. Furthermore, Syms' (1969) summary of McKean in Manitoba remains the only large-scale overview of the McKean complex in Canada. While extremely valuable at the time, this research is now outdated by the large volume of data recovered in recent years. As a result, this volume is intended to update the McKean record in the Canadian Plains and offer insights into the various issues related to McKean research both in Canada and the United States.

1.2 Statement of Objectives

In light of the problems discussed previously, the overall objectives of this research are two-fold. The first part of this dissertation is devoted to summarizing new and existing data from excavated McKean components in the Canadian Plains. Included is an in-depth summary of EgNo-23, a newly discovered kill site and associated occupations. A detailed summary of the Redtail and Thundercloud reports is also provided, as well as minor descriptions of the remaining McKean assemblages from Alberta, Saskatchewan and Manitoba. The inclusion of such data, into a single volume, not only introduces information from a number of unpublished and obscure sources, but also provides the comparative basis for later interpretations.

The second objective is to use the new and existing data to update and outline current issues in McKean research. Of primary importance is an understanding of the McKean chronology. Since 1986 at least twenty new McKean radiocarbon dates have been added to the record in Saskatchewan alone, doubling the amount of available data. Furthermore, many of these dates were obtained from multi-component sites with separate lanceolate (McKean Lanceolate) and stemmed point (Duncan-Hanna) assemblages. This information is invaluable in assessing theories on McKean origins and more importantly may help resolve the issue of whether the projectile point varieties identified as McKean represent coeval variants in the same complex or discrete temporal, yet seemingly related types. Finally, with evidence from an increasing number of McKean components it is now possible to draw a more accurate picture of McKean subsistence and settlement strategies in the Canadian Plains. This data can then be compared to the McKean record in the 'core' region to assess the apparent shift in McKean adaptations from one region to the next. Specifically, the goals of this research are as follows:

1. To compile and summarize new and existing McKean data from the Canadian Plains.

2. To compare this data to information from surrounding areas to gain a better understanding of:
    a. McKean Subsistence and Settlement Patterns;
    b. McKean origins; and
    c. McKean Taxonomy (as it relates to Typology).

3. To summarize new radiocarbon dates and re-assess existing dates in an effort to:
    a. Refine the McKean chronology in Saskatchewan.
    b. Assess the possibility of a temporal separation between the various projectile point styles attributed to McKean.

4. To examine the apparent differences between northern and southern McKean populations and to outline any similarities in an attempt to assess the relationship between these regions.

5. To outline potential areas for future research with regard to McKean and other Middle Period cultures.

1.3 Chapter Summary

Chapter 2 provides an updated overview of McKean components in the Canadian Plains. The first section of this chapter begins with a summary of the excavation and analysis at EgNo-23, a bison kill and multi-component campsite that was discovered in 1999 during the construction of a natural gas pipeline near the town of Elbow, Saskatchewan. The investigation of EgNo-23 focused on two distinct areas, a disturbed bone bed and a large excavation block. Artifacts and radiocarbon dates associated with the disturbed bone bed indicate the presence of a McKean kill site. At least four components were recorded in the excavation area and the assemblages associated with cultural levels 2 and 3 are attributed to people using McKean projectile points. Also included in this section is an examination of McKean components from a number of sites located in Wanuskewin Heritage Park near Saskatoon, Saskatchewan. Included is a detailed summary of the multi-component McKean assemblages from the Redtail and Thundercloud sites. Brief summaries of the ongoing analyses of recoveries from the Cut Arm and Meewasin sites are also provided. Data from the sites at Wanuskewin and EgNo-23 have yet to be published and, as such, are summarized in greater detail than the information from the published sources that follow. The second section of Chapter 2 includes a brief summary of select McKean components from Alberta, Saskatchewan and Manitoba. All of these sites have spawned some form of publication, although many of these are difficult to find or were never widely circulated. In combination with the new data from unpublished sources, this information is provided to update the McKean record in the Canadian Plains.

Chapter 3 is the first of three chapters that attempts to use the new information to re-evaluate McKean in the Canadian Plains. Chapter 3 focuses on McKean subsistence and settlement patterns. This chapter opens with an overview of McKean subsistence strategies, including a summary of previous research in Canada. A discussion of new data follows, including an examination of the potential effects of sampling strategy on previous interpretations. The second section evaluates McKean settlement patterns, introducing the new information provided by multi-component campsites such as Redtail, Thundercloud and EgNo-23. Included is a brief overview of site location and evidence for the use of structures. Comparisons are made to similar observations for McKean sites in the northern United States.

Chapter 4 examines a variety of theories regarding McKean origins and also summarizes current hypotheses regarding the expansion of McKean into the Canadian Plains. Several lines of evidence including information from a number of artifact assemblages, burial style, and radiocarbon dates are then presented in support of a McKean migration from the northern United States.

Chapter 5 outlines the current problems with McKean taxonomy. The opening section re-addresses the problems with McKean projectile point typology and new views on the number and types of projectile points associated with McKean. The following sections examine stratigraphy and radiocarbon dates from McKean components located throughout the Northern Plains in an attempt to resolve some of these issues. The final section of this chapter uses these new observations to support the interpretation that McKean is better represented as a 'series' rather than a 'complex'.

Chapter 6 summarizes the results of the re-analysis including a restatement of the research objectives. Several conclusions are presented with respect to McKean subsistence, origins, and taxonomy. This chapter closes with an examination of the limitations of the current database and suggestions for future research.

Chapter 2

McKean Components From the Canadian Plains

The following chapter provides a summary of McKean components in the Canadian Plains. This discussion begins with a detailed overview of components from three Saskatchewan sites: EgNo-23, Redtail, and Thundercloud. At present, data from these sites have yet to be published. Also included are brief descriptions of published data from McKean assemblages located in Saskatchewan, Alberta and Manitoba. These summaries are meant to update the McKean record and to provide a base of information from which later interpretations can be made. This compilation is by no means complete and is intended to represent sites that exhibit relatively good stratigraphic context or have otherwise been important in previous interpretations of McKean in the Canadian Plains. Even so, it is believed that the following descriptions represent a majority of the more significant McKean components in Canada.

Part A: Unpublished Data

2.1 EgNo-23

EgNo-23 is a large multi-component site located just north of the Douglas Park Sand Hills in southcentral Saskatchewan (Figure 2.1:1). A regional collector first recorded the site as a surface scatter in 1986 and buried components were not discovered until 1999 when archaeologists from Fedirchuk McCullough and Associates (FMA) began monitoring trenching associated with the construction of the Alliance natural gas pipeline. The excavation of the trench by heavy equipment led to the displacement of many of the artifacts onto the pipeline right-of-way. Exposed materials were collected, including at least 41 formed tools and 22 expediency tools (Himour 2000). A large amount of bone was also collected (over 4000 specimens) and suggested the presence of a kill site.

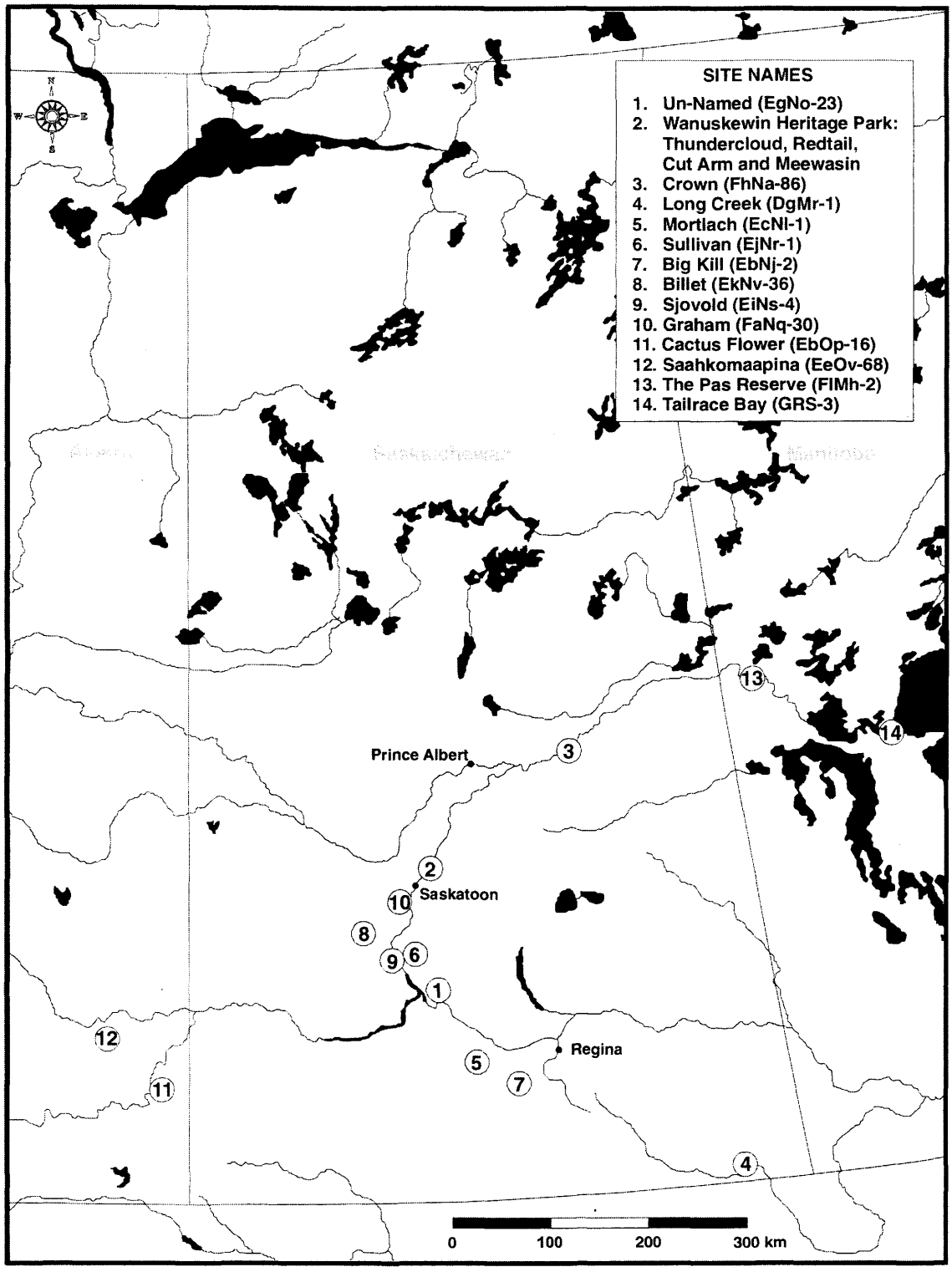

Figure 2.1. The Location of Select McKean Components in Canada.

Two paleosols were noted in the side of the trench with average depths of 20 to 30 cm below the surface and 45 to 57 centimeters below the surface. A small number of *in situ* faunal elements including a partially articulated bison skeleton were also noted in the side of the pipeline trench, located roughly 40 to 50 centimeters below the ground surface (Himour 2000:2). Unfortunately, pipeline construction precluded the collection and further examination of the articulated elements. Several diagnostic projectile points were recovered among the disturbed bone including one McKean Lanceolate point and one Besant series projectile point. The identification of several point styles provided further confirmation for the presence of a multi-component site.

A post-impact assessment was conducted by FMA in the summer of 2000. Intensive auger testing revealed that a significant portion of the site remained intact but gave no indication of the presence of a buried bone bed. Ten 1x1 meter test units were then excavated in areas deemed to be high potential. At least three buried components were identified; the upper associated with a single Besant projectile point and a middle component associated with two Hanna points. Diagnostic items were not found in the lower component, however, based on the presence of the McKean Lanceolate point in the disturbed portion of the pipeline right-of-way, it was assumed that the occupation could also be attributed to McKean. More importantly the stratigraphic position of the faunal elements within the pipeline trench and the association of the McKean point with the disturbed bone bed was highly suggestive of a McKean kill site. As a result more intensive archaeological investigations were undertaken in the summer of 2001 including a combined team of researchers from both FMA and the University of Saskatchewan. Another 47 square meters were excavated in two separate blocks. As many as seven cultural occupations were discovered and diagnostic projectile points were identified in all but one level. A bone bed of unknown cultural affiliation was discovered in three of the excavation units. The stratigraphic position of this bone bed suggested a later kill episode un-related to the aforementioned materials.

Unfortunately buried deposits associated with the disturbed faunal materials were not located during the investigation. It would appear that the main portion of the McKean kill site was directly in the path of the pipeline trench. The excavation and subsequent re-distribution of the bulk of the bone bed assemblage eliminates the possibility of examining artifact association and severely hampers any discussion

regarding the exact nature of this kill episode. Even so, when one considers the paucity of McKean kill sites in the Northern Plains any amount of recoverable data becomes significant.

A complete discussion of the McKean components from EgNo-23 is provided in the appendices (A and B) and currently serves as the primary report for these components.

2.1.1 Disturbed Bone Bed

Collection in the area of the disturbed bone bed led to the recovery of over 4,000 faunal specimens. Much of the assemblage was identifiable and all specimens are believed to be representative of modern bison (*Bison bison*). Two projectile points are thought to be directly associated with the faunal remains and both have been identified as McKean Lanceolate points (Figure 2.2).

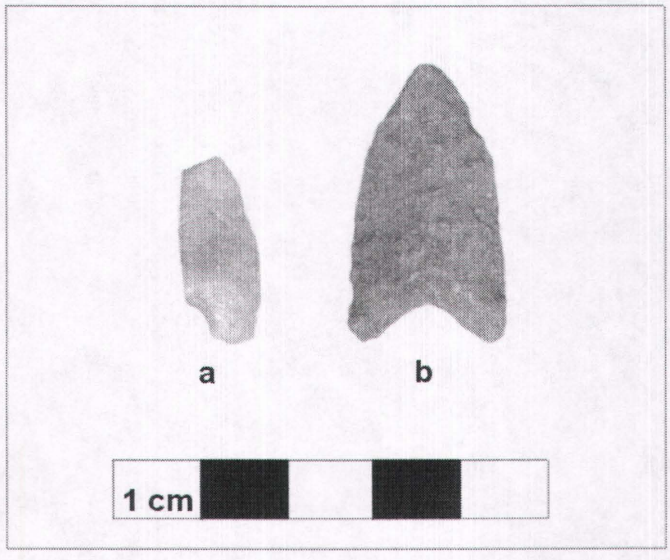

Figure 2.2. McKean Lanceolate Projectile Points Recovered in Association with the Disturbed Bone Bed.

Two of the faunal elements were submitted to Brock University for radiocarbon analysis, providing similar ages of 3540±50 rcybp (BGS-2366; cal 4086 [3957, 3952, 3925, 3918, 3911] 3733) and 3530±50 rcybp (BGS-2386; cal 4085 [3954, 3954, 3903] 3730).

Taphonomic analyses indicate that rootlet etching has impacted much of the assemblage, reducing the ability to identify smaller cut marks. Even so, there was evidence of butchery on several specimens, indicating activities such as skinning, filleting and dismemberment. Several of the elements also exhibit impact fractures that are likely the result of marrow extraction and at least one rib fragment revealed evidence of a projectile point impact.

As many as 19 bison appear to have been killed at the site and the majority were mature individuals. Quantitative measurements from the carpals, tarsals, and phalanges indicate that the bison herd was composed primarily of male bison and dental eruption schedules suggest that the kill occurred in mid to late summer. An examination of the site stratigraphy indicates that the area was dominated by stabilized sand dunes at the time of the McKean occupations and, although speculative, the animals appear to have been ambushed in a low area between the crests of two dunes. Air photo analysis revealed the outline of a shallow water slough in the immediate vicinity of the site, a potential watering hole for a large group of animals. As a result, it seems likely that the combined use of a natural trap and an ambush-style of hunting are the best interpretation given the available data.

2.1.2 Buried Components

A total of seven occupations were identified during excavation and three of these (occupations 2a, 2b and 3) are associated with McKean projectile points. Stratigraphic separation was not always evident between occupations 2a and 2b and, as a result, both occupations were analyzed as a single unit (Cultural Level 2) in some areas of the site. Radiocarbon samples were obtained from all of the cultural levels and are summarized in Table 2.1.

Table 2.1. Radiocarbon Dates and Associated Projectile Points from Excavated McKean Components at EgNo-23.

Occupation	Radiocarbon Date			Lab Number	Assoc. Points
	Calculated Age	Normailzed Age	Calibrated Range*		
Occupation 2a	3348±50	3427±50	3830-3565 BP	BGS 2363	Duncan-Hanna
Occupation 2b	3430±40	3520±40	3890-3650 BP	Beta-167310	Hanna?
Cultural Level 2	3440±55	3537±55	3980-3640 BP	BGS 2364	Hanna
Cultural Level 3	4140±60	4240±60	4870-4575 BP	Beta-183521	McKean Lanceolate

* Based on the 2 Sigma calibration from intercepts (calibration source Struiver and Reimer 2000, CALIB 4.3).

Cultural Level 2

Materials assigned to Cultural Level 2 were recovered in the westernmost units of the main excavation block. Two projectile points were recovered, one identified as Duncan-Hanna and the other as Pelican Lake (Figure 2.3:b). The Duncan-Hanna point is extensively re-worked and appears to have been used as a hafted drill (Figure 2.3:a). The stratigraphic position of the Pelican Lake point is suspect and is believed to be associated with occupation 1c.

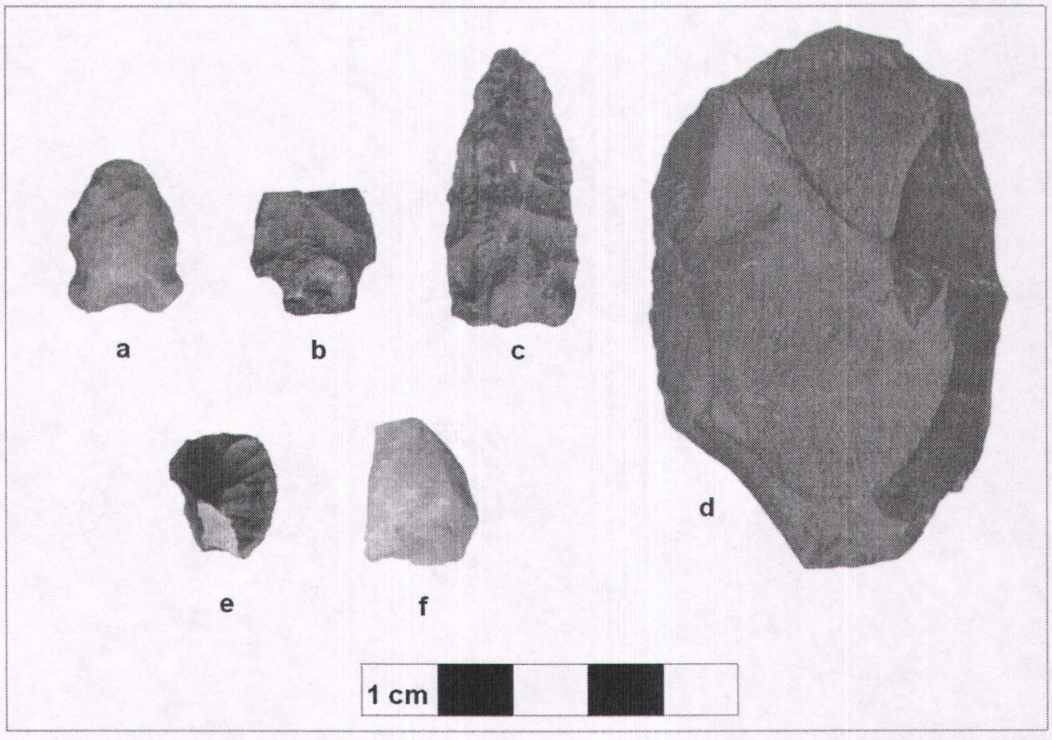

Figure 2.3. Projectile Points (a-b), Bifacial Preform (c), MURL (d), Uniface (e), and a Wedge (f) from Cultural Level 2 at EgNo-23.

The remaining tool assemblage consists of a complete bifacial preform, five biface fragments, 13 marginally utilized or retouched lithics (MURL's), a uniface, and a wedge. The bifacial preform is lanceolate in shape with a relatively straight basal margin (Figure 2.3:c). The lateral edges are sinuous and lack evidence of use wear. Multiple hinge fractures along both the dorsal and ventral aspects indicate failed attempts at thinning, leading to the eventual discard of this artifact. The biface fragments exhibit bending type fractures and appear to represent portions of ovoid-shaped tools. Most of the MURL's are expediency tools, exhibiting minimal use wear

and edge retouch. One specimen (Figure 2.3:d) is unifacially retouched along the lateral and distal edges and may have been used as a large scraper. The uniface has well-patterned flaking along the right lateral edge and is best described as a side scraper (Figure 2.3:e). A small wedge was also recovered (Figure 2.3:f), but minimal evidence of battering at the proximal and distal ends indicates that the item saw little use.

Lithic debitage is dominated by quartzite (35.9%; n=836) followed by significant amounts of silicified wood, Tongue River silicified sediment, and siltstone. The presence of relatively large amounts of Tongue River silicified sediment (14.9%; n=346) is significant and suggests a trade link to populations in the source area (Montana/North Dakota). Debitage consists primarily of secondary and tertiary flakes indicating end stage tool manufacture and/or tool rejuvenation.

Four features were identified in Level 2 and include a stone-boiling pit, an organic stain, a small cluster of lithic debris, and a large concentration of flakes. All of the features are clustered together and, along with associated debris, form a semi-circular pattern of artifacts. It is possible that such a pattern delineates the borders of a temporary living structure, or it may simply reflect a number of well-defined activity areas.

The faunal assemblage is dominated by elements from bison. Several specimens from a northern pocket gopher (*Thomomys talpoides*) were also recovered and based on bone colour they are believed to be intrusive. At least three bison were identified, but unfortunately the specimens are too fragmented to determine approximate age, gender, or seasonality.

Artifact distribution patterns (Appendix B; Figure B.1 and B.2) reveal that activities are clearly centered around the boiling pit. The pit is associated with a significant amount of fire-broken rock suggesting meal preparation or the manufacture of bone grease. Lithic debris located around the boiling pit is indicative of tool rejuvenation and the presence of platform rejuvenation flakes (in feature 5) may indicate the manufacture of several tools as well. Three of the four features are located near the bottom of the paleosol and should be considered part of the occupation 2b assemblage.

Cultural Level 2; Occupation 2a

Occupation 2a yielded a relatively small artifact assemblage. Two diagnostic projectile points were identified, both represented by basal fragments. The first (Figure 2.4:a) is identified as a Duncan-Hanna point. The base is concave with a gently expanding stem and there is a small shoulder on the right lateral edge. The second point (Figure 2.4:b) is best described as Duncan and is broken just above the shoulders. The stem is parallel with shallow basal concavity. Both points are constructed from Swan River chert.

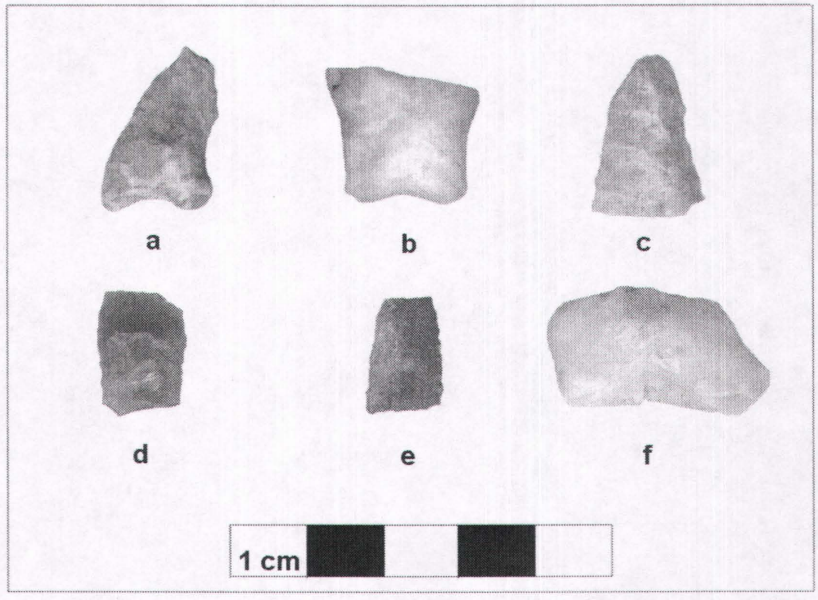

Figure 2.4. Projectile Points (a-b), Biface (c), Side Scraper (d), MURL (e), and Wedge (f) from Occupation 2a at EgNo-23.

Other Identified tools include a fragment of a bifacial tool, two bifacial preforms, a side scraper, a uniface, two wedges, four MURL's, and two cores. The bifacial tool is represented by a tip fragment (Figure 2.4:c). The distal end is rounded with evidence of use wear. The side scraper (Figure 2.4:d) is constructed from Knife River chalcedony and has steep unifacial retouch along both lateral margins. One of the MURL's is snapped along both the proximal and distal ends (Figure 2.4:e) and may be a fragment of a crude drill. Both of the wedges are complete, although one of the specimens (Figure 2.4:f) was reconstructed and appears to have fractured during use.

Lithic debitage consists primarily of Swan River chert (29.7%; n=89), followed by quartzite, silicified wood, indeterminate chert, and silicified sediment (likely the Tongue River variety). Secondary and tertiary flakes show a similar frequency by number and together they account for 90.6% of the recovered debitage.

A single feature was identified in occupation 2a, represented by a small concentration of bone fragments and an associated soil stain. Sediments in the stained area have a greasy texture with a number of charcoal inclusions. The bone is severely deteriorated and appears to have been extensively boiled. The feature is interpreted as a spill zone associated with the maintenance of a boiling feature.

The faunal assemblage is heavily fragmented leading to the identification of a single bison. Few specimens were complete and, as a result, the season of occupation could not be determined. A single element from a northern pocket gopher was also identified and is believed to be intrusive.

An examination of distribution patterns clearly shows that artifacts are distributed around the spill feature (Appendix B; Figure B.3 and B.4). Primary activities appear to be focused around the use and maintenance of a stone-boiling pit that may be located in un-excavated units to the north. Site occupants processed at least one adult bison and part of this processing included the boiling of bone, perhaps to obtain bone grease. The presence of numerous small secondary and tertiary flakes indicates that end stage tool manufacture and/or tool rejuvenation were also important activities.

The identified assemblage suggests the presence of a small, short-term campsite occupied by relatively few individuals, perhaps a family unit.

Cultural Level 2; Occupation 2b

The assemblage from occupation 2b is extremely sparse. No projectile points were identified, however, as mentioned previously the features identified in the western portion of the excavation block (in Cultural Level 2) are believed to be associated with the lower occupation and a Hanna projectile point was recovered in this area. An AMS date of 3430±40 rcybp (Beta-167310; cal 3894 [3828, 3788, 3778, 3734, 3734] 3652) from occupation 2b is almost identical to the date of 3440±55 rcybp (BGS-2364; cal 3977 [3785] 3644]) obtained from Feature 3A in Cultural Level 2, providing further evidence to suggest that the assemblages are related.

Stone tools that have been definitively identified to occupation 2b include four MURL's, one side scraper, and a wedge. The relatively small sample of lithic debitage (n=259) is dominated by chert, Tongue River silicified sediment, silicified wood, and

quartzite. Several quartzose flakes were also identified, a material that is present near the features from the western excavation units, but not identified in occupation 2a.

The faunal assemblage is highly fragmented and only bison are represented. At least two individuals have been identified and both appear to be mature animals, although elements lack characteristics needed to determine age or gender. Likewise, seasonal indicators were not recovered in this assemblage. Many of the recovered longbone fragments exhibit spiral fractures suggesting the breakage of limb elements to retrieve bone marrow.

At present, there are no features that can be definitively assigned to occupation 2b. Artifact distribution patterns (Appendix B; Figure B.5 and B.6) indicate that fire broken rock and faunal remains increase in density towards the western end of the main block and they likely represent debris that is peripheral to the activity areas described for Cultural Level 2. If so, occupation 2b is best described as a temporary campsite. Identified activities include bifacial reduction, tool rejuvenation and manufacture, food preparation, and possibly the manufacture of bone grease.

Cultural Level 3

Cultural Level 3 yielded a much larger sample of lithic tools and faunal remains. A single radiocarbon date of 4140±60 rcybp (Beta-183521; cal 4872 [4831] 4575) was obtained from a sample of bison bone located in the middle of the associated paleosol. Two projectile points were recovered in Level 3. The first is identified as a McKean Lanceolate point (Figure 2.5:a) that has been re-worked along the right lateral edge. A small hinge fracture is present at the distal end of the right edge that appears to have halted further attempts to re-shape the point. The second projectile point (Figure 2.5:b) is broken just above the shoulders and includes a small portion of the base. The point is constructed from a secondary flake and is shaped primarily by unifacial retouch. The point is quite small and is stylistically similar to Besant series projectile points more common in the upper occupations of the site (in the sod and in occupation 1a). Excavation notes from the unit of recovery indicate the presence of numerous rodent burrows and it seems likely that this point was secondarily deposited.

The remainder of the tool assemblage includes three broken bifacial tools, four bifacial preforms, ten cores, five endscrapers, a hammerstone, 20 MURLs, two perforators, two spokeshaves, and 5 wedges. Two of the broken bifacial tools may be tip fragments from broken projectile points (Figure 2.5:c-d). A more detailed summary of the remaining tool assemblage is provided in Appendix A (Section A.3.5).

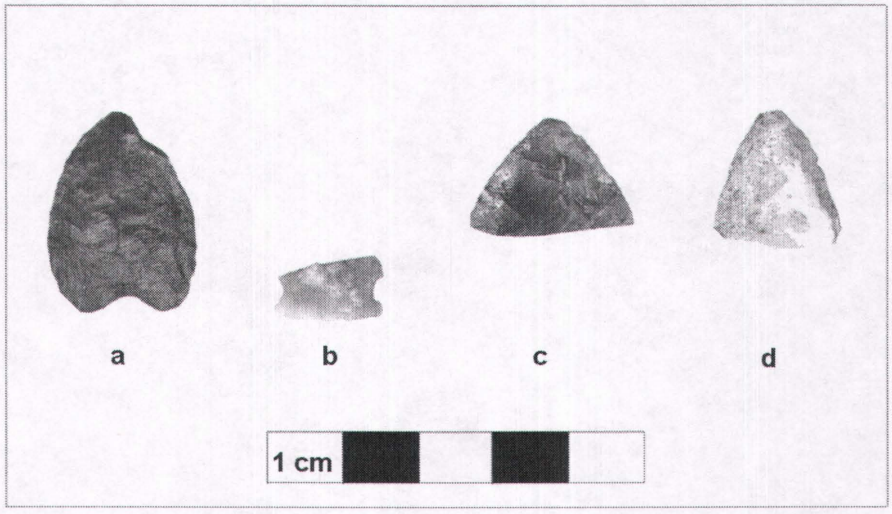

Figure 2.5. Projectile Points (a-b) and Bifacial Tools (c-d) from Cultural Level 3 at EgNo-23.

Level 3 debitage is dominated by local lithic materials, consisting primarily of quartzite (n=195; 43.1%) and Swan River chert (n=87; 19.3%). Silicified wood and indeterminate chert is also common. Exotic materials are present in small quantities including Tongue River silicified sediment, Knife River chalcedony, and a single flake of Cathead chert. Secondary flakes are numerous (n=326, 72.1%) with a much higher percentage than the Level 2 assemblages. Similarly the percentages of shatter, primary flakes and platform rejuvenation flakes are also higher. Unlike later occupations, cores (n=10) are much more common and it appears that much of the debitage from Level 3 is the result of the primary production and reduction of flakes.

The Level 3 faunal assemblage includes elements from at least three bison, one canid, and one northern pocket gopher. Gender analysis of the bison carpals and tarsals indicates that one of the individuals was a female and another a cow/calf. Spiral fractures are present on all of the larger longbones fragments and several of the elements display impact fractures. In general, faunal specimens are larger in Level 3 and suggest that the site inhabitants were processing the limbs for nutrient rich bone marrow rather than bone grease. The single canid element is from a coyote or domesticated dog and is believed to be part of the cultural assemblage. The single element from the pocket gopher has a different colour and texture than the surrounding faunal elements and is believed to be intrusive.

Two features were identified in Level 3 and include a small basin-shaped hearth and a concentration of broken rock and lithic debitage. The hearth was only partially exposed, and was lined along one side with fire broken rock. The cluster of rock and debris included fire and water-fractured stone, shatter, several flakes, and a small exhausted core. The scatter was not associated with a pit and may represent a small workshop or midden related to hearth maintenance.

Artifact patterns indicate the presence of several activity areas in Level 3 (Appendix B; Figure B.7 and B.8). In the eastern portion of the main excavation block artifacts are clearly associated with the hearth feature and nearby scatter. Faunal elements are concentrated between the features and may be related to food preparation in the hearth. A large number of endscrapers, MURLs, and several perforators were found to the southeast of the lithic scatter, in an area relatively void of other artifacts. It is possible that the area was used to process and finish bison hides leading to the observed artifact pattern. A second large activity area is present in the extreme northern end of the excavation. Bison elements are more numerous in this area and include a relatively high frequency of cranial and vertebral elements suggesting the presence of a secondary processing area, perhaps in close proximity to the kill site.

2.1.3. Summary

The initial investigation of the bone bed at EgNo-23 has led to the identification of the first recorded McKean kill site in the Canadian Plains. Evidence for a pound or enclosure was not recorded during the collection of the faunal remains, although such evidence is likely to have been destroyed. Even so, the general topography of the area indicates the use of a natural trap to kill a herd of predominately male bison.

The occupations at EgNo-23 are significant in that they reveal a clear separation of the McKean Lanceolate and Duncan-Hanna projectile point types. The assemblage recovered from the lower McKean Lanceolate occupation may be associated with the kill site as evidenced by a number of artifacts, features and faunal remains that are more typical of a bison processing area. Even so, the artifacts and features recovered from level 3 do not support the intense processing of bison by a large number of individuals and it is possible that these assemblages represent un-related events. Differing radiocarbon dates from the disturbed bone bed and cultural level 3 support this interpretation. Artifact assemblages from cultural level 2 appear to be more indicative of small-scale campsites occupied by a relatively small number of

individuals. Activities areas within these campsites are limited in size and are concentrated around a number of shallow hearth features. Primary activities include food preparation and the refurbishment and/or production of stone tools.

2.2 Wanuskewin Heritage Park

In 1982 a survey and assessment of Tipperary Creek (now known as Opimihaw Creek) near Saskatoon, Saskatchewan led to the discovery of 21 archaeological sites and 19 of these contained pre-contact components (Walker 1983). In an effort to preserve the natural and historical heritage of this area the Meewasin Valley Authority initiated the development of a heritage park, called Wanuskewin, which could serve as an institute for education and research. Located approximately 5 kilometers north of the City of Saskatoon, Wanuskewin Heritage Park encompasses 63 hectares of land including much of the Opimihaw Valley and the surrounding uplands (Figure 2.6).

At present a portion of the laboratory at Wanuskewin serves as a satellite facility for the University of Saskatchewan. Shortly after the initial survey the Department of Anthropology and Archaeology (now the Department of Archaeology) created a research program focused on the detailed examination of sites within the park. Currently excavation has been completed at the following sites: Amisk (Amundsen 1986), Newo Asiniak (Kelly 1986), FbNp-1, Redtail (Ramsay 1993), Thundercloud (Mack 2000; Webster 1999), Meewasin, and Cut Arm. Four of these sites (Redtail, Thundercloud, Meewasin and Cut Arm) are of particular importance to the present study since each contains at least one McKean occupation.

2.2.1 The Redtail Site (FbNp-10):

The Redtail site is located in a small basin approximately 200 meters from the South Saskatchewan River (Figure 2.6:1). Archaeological investigation of the site began in the summer of 1988 and was completed in the summer of 1989. A total of 44 m^2 were excavated to a maximum depth of 2.3 meters below the ground surface (Ramsay 1993:9). As many as 26 cultural occupations were identified and suggest a relatively continuous habitation of the site from the recent past to as far back as 5000 years ago (Ramsay 1993:69).

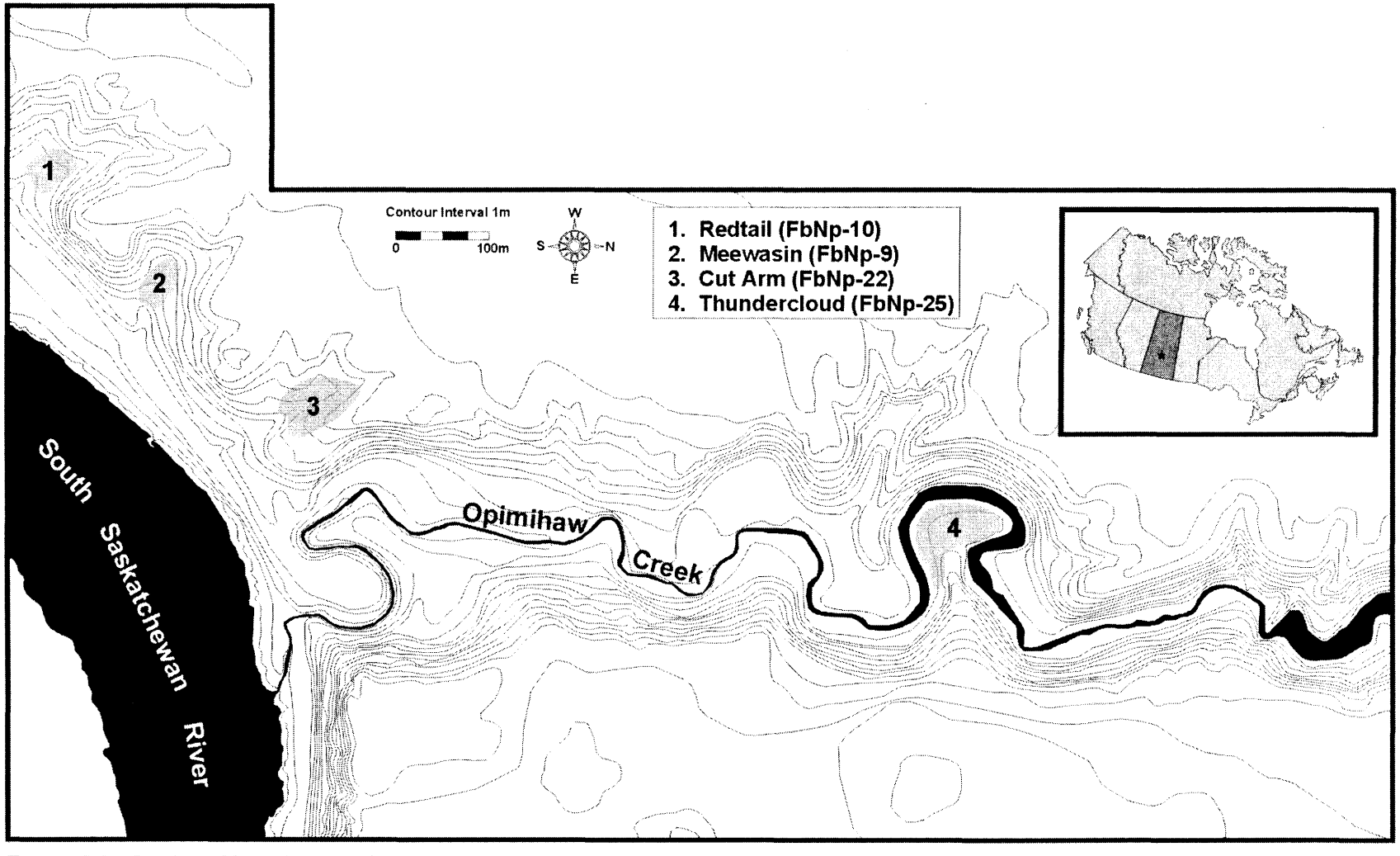

Figure 2.6. Contour Map of Wanuskewin Heritage Park Including the Location of Sites with McKean Components.

The uppermost occupation (within the sod layer) contains a number of historic artifacts that can be dated to within the last 50 years. Immediately below the sod are several occupations that include both Avonlea and Besant projectile points. Diagnostic artifacts were not recovered from layers 3 through 7 (a total of six occupations) but are thought to be associated with the Late Middle Precontact Period (Ramsay 1993:79-80). Layers 8, 9, and 10 also lack diagnostics but are attributed to the Middle Middle Precontact Period based on overall depth and similarities of the artifact assemblages to materials from deeper levels. Occupations 11, 12(1), 12(2), 13(1), 13(2), 13(3), and 13(4) yielded artifacts from the McKean complex and are of primary importance to this study. Another six occupations (in Layers 14 and 15) were identified below the McKean levels. Diagnostics were lacking but a radiocarbon date of 5010±90 rcybp (S-3007; cal 5949 [5735] 5589) from Layer 15 provides a basal date for the occupations (Ramsay 1993:90).

Ramsay (1993:416-417) includes the assemblages from Layers 8-10 in his analysis of the McKean occupations. At present there are no diagnostics or radiocarbon dates from these levels to warrant their association with McKean, however, a pithouse identified in Layer 8 does appear to be similar to archaic aged pithouses from Wyoming (Larson 1997) and may at least suggest an association with the Middle Middle Precontact (Middle Archaic) Period.

A summary of the lithic artifacts and features recovered from Layers 11-13 is provided in Appendix C, Table C.1. Projectile points were identified in four of the seven McKean occupations and include McKean Lanceolate, Hanna and possibly Duncan forms. Six radiocarbon dates are available from the McKean layers (Table 2.2). Interestingly, both stratigraphy and radiocarbon dates suggest that the McKean Lanceolate point variety is older than the Duncan-Hanna style.

Table 2.2. McKean Radiocarbon Dates from the Redtail Site (Ramsay 1993:90).

Occupation	Radiocarbon Date			Lab Number	Assoc. Projectile Points
	Calculated Age	Normalized Age	Calibrated Age*		
11	3480±80	3580±80	4091-3642 BP	S-3372	Hanna
12(1)	3470±80	3570±80	4089-3640 BP	S-3373	Hanna
12(2)	3660±75	3740±75	4352-3873 BP	S-3008	Hanna
13(2)	3860±70	3965±70	4778-4163 BP	S-3374	McKean/Duncan?
13(2)	3880±70	3980±70	4785-4240 BP	S-3375	McKean/Duncan?
13(4)	4280±80	4360±80	5285-4826 BP	S-3009	McKean Lanceolate

* Based on the 2 Sigma calibration from intercepts (calibration source Stuiver and Reimer 2000, CALIB 4.3).

Layer 11

Layer 11 produced a single projectile point identified as Hanna (Figure 2.7:a). The basal portion of the point is missing but the overall size and shape of the shoulders favor a Hanna classification. A core, a uniface and a preform were also recovered and are all constructed from Swan River chert. Chert, and particularly Swan River chert, is very common and makes up 70% of the lithic assemblage. The remainder of the assemblage is comprised of local lithic materials including siltstone, silicified peat, crystalline quartz, and quartzite (Ramsay 1993:99).

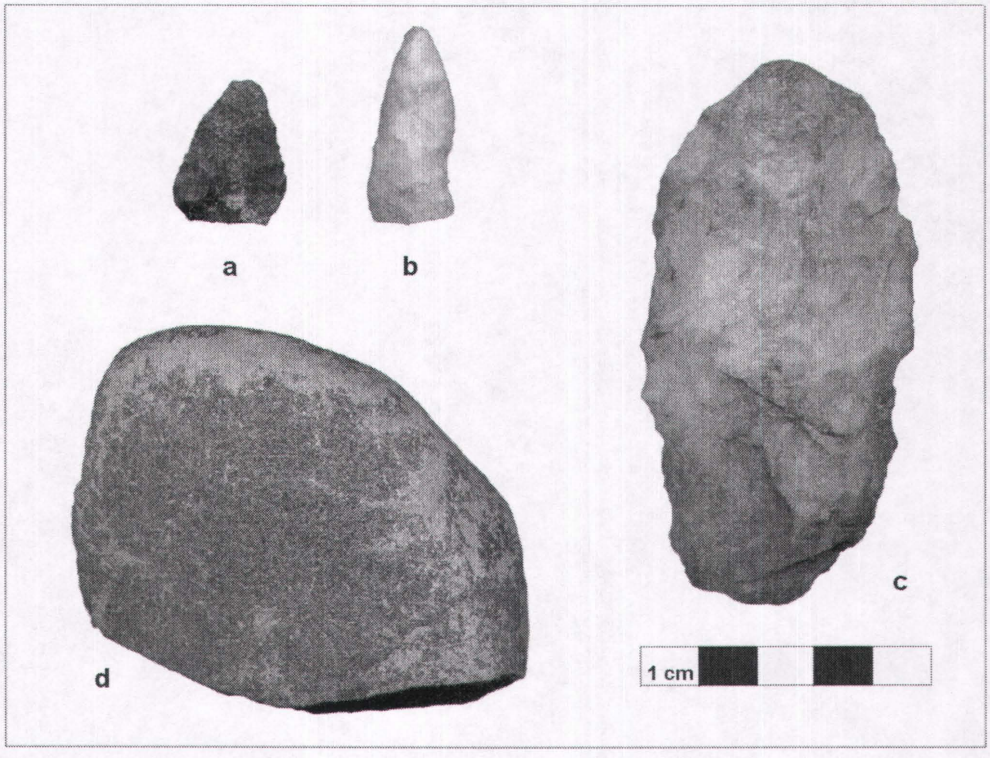

Figure 2.7. Projectile Point (a), Uniface (b), Preform (c) and Possible Grinding Stone (d) from Layer 11 at the Redtail Site.

A total of 16 features were identified including eight charcoal concentrations, seven surface hearths and a single basin-shaped hearth. Five of the hearths are clustered amidst a circular pattern of lithic and faunal remains and the configuration of the artifacts seems to indicate the presence of a habitation structure. Lithic debitage and fire broken rock are more common in the southern half of the circular pattern outlining a distinct activity area (Ramsay 1993:288).

Of particular importance is the recovery of a possible grinding stone (metate) fragment (Figure 2.7:d) in this layer. The fragment was associated with a large charcoal concentration and midden area located several meters west of the basin-shaped hearth. It appears that the midden and charcoal were deposited as a result of hearth maintenance and the broken grinding stone was included within this debris. To my knowledge this would be the first occurrence of a McKean grinding stone in the Canadian Plains. Equally significant is the fact that soil samples from the basin-shaped hearth were submitted for flotation analysis and contained 20 complete and 165 fragmented seeds (Table 2.3). Most of the seeds represent potential food items, although Ramsay (1993:239) notes that several may have also been used for medicinal purposes. Seeds were also identified in a sediment sample from another hearth feature (Feature 5) but are less numerous. Three complete *Chenopodium* seeds and a mint seed (family Labiatae) represent the identifiable specimens. This new evidence has direct implications on interpretations of McKean origins and subsistence and will be discussed further in the following chapters.

Table 2.3. Summary of Seeds and Seed Fragments Recovered From Feature 2 at the Redtail Site (from Ramsay 1993:237).

Taxon	Complete	Fragments	Total
Chenopodium sp.	9	2	11
Prunus sp.	-	5	5
Rosa sp.	2	7	9
Symphoricarpos sp.	1	16	17
cf. Compositae	1	-	1
Unidentified Seeds	7	134	141
cf. Bud fragment	-	1	1
Total	**20**	**165**	**185**

The faunal assemblage from Layer 11 includes elements from two bison, a deer, two canids, a mustelid, three rodents, and one frog or toad. Measurements from several longbones indicate that one of the bison is female. Several immature elements represent a second individual that is approximately 1 year of age. The deer elements are also from an immature individual with a suggested age of 11 to 12 months and corroborate the data from the bison elements in the suggestion that the site was occupied during the late spring or early summer (Ramsay 1993:162-170).

Canid elements represent at least two animals (one wolf-sized and one coyote-sized) and numerous cut marks were recorded on the distal-posterior end of a wolf-sized humerus. Several phalanges and metapodial fragments are burned and hint at the use of canids for food (Ramsay 1993:175). Elements from a skunk and several rodents show no evidence of cultural modification and the importance of these animals as a food resource is difficult to assess.

Artifact distribution patterns indicate the presence of several activity areas. A cluster of hearths outlining a possible habitation has already been mentioned. Artifacts within the 'structure' are indicative of bifacial reduction and tool manufacture. Approximately 2.5 meters southeast of the structure is the basin-shaped hearth and associated debris. The presence of seeds, comminuted bone, and a grinding stone suggest that the area was used to process food. A third activity area appears to be associated with core reduction. This area includes a cluster of lithic debris and small hearths located several meters to the northeast of the basin-shaped hearth (Ramsay 1993:288). Overlapping profiles indicate the re-use of several features but in general artifact frequencies suggest a relatively short occupation for Layer 11.

Layer 12; Occupations 12(1) and 12(2)

Two occupations were identified in Layer 12, but they could not be adequately separated by depth and were analyzed as a single occupation. Radiocarbon dates from the top and bottom of the layer (see Table 2.2) differ by approximately 200 years and support the identification of separate assemblages.

Six projectile points were recovered in Layer 12. Three of the points are complete (Figure 2.8:a-c) and are identified as Hanna. The remaining three are basal fragments that have snapped laterally across the shoulders. Two of these have a basal configuration similar to the complete points while the third (Figure 2.8:e) has a much deeper basal concavity. Based on these criteria this point may be more representative of Duncan than Hanna. Slight shouldering is present, but the break is too low to determine the exact shape. As such, a designation of Duncan-Hanna is preferred. All of the remaining points have broad, shallow notches with an expanding stem. Basal margins are either straight or slightly concave. Four of the points are made from Swan River chert, one from diatomite and another from siltstone. The complete points have been re-worked with evidence of use wear on at least one lateral edge. Ramsay (1993:289) indicates that these may have functioned as both projectile points and hafted knives.

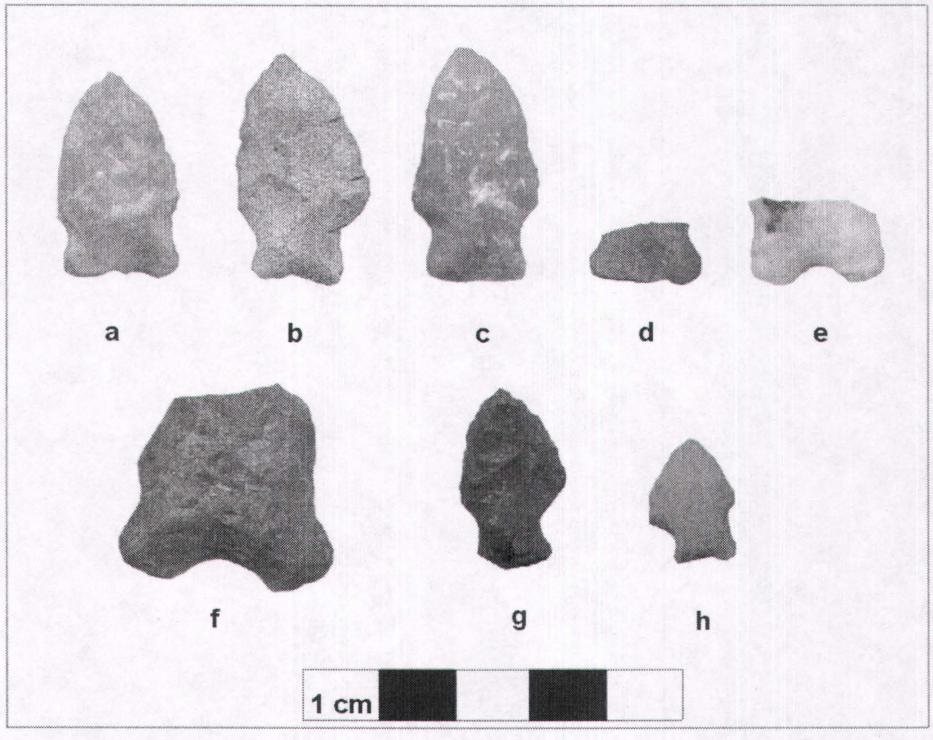

Figure 2.8. Projectile Points (a-e), Hafted Biface (f), and Flake Points (g-h) from Layer 12 at the Redtail Site.

A total of 20 cores were recovered in Layer 12. Many of the cores have multiple striking platforms and the removal of flakes from bifacial cores is the preferred technique. All of the cores have been made from local lithic materials and many have been completely reduced or were fragmented and could no longer be used (Ramsay 1993:109).

The remaining tool assemblage includes a hafted biface, two unifacial flake points, a pointed biface fragment, a broken bifacial preform, six MURLs, four pecked stone tools, a bifacial chopper, and a uniface. The hafted biface is broken laterally across the body (Figure 2.8:f). It has broad notches and a deep basal concavity giving it an "eared" appearance similar to Oxbow projectile points. The artifact is quite thick and is crudely manufactured, and evidence of haft-wear or edge dulling is present along the stem. These characteristics indicate that the artifact was manufactured as a large bifacial tool (knife) and does not represent a re-worked projectile point. Similar items from the Sullivan site in south central Saskatchewan have also been interpreted as lance tips (Johnson 1975:10). The flake points are minimally worked but the overall

shape suggests a Hanna classification (Figure 2.8:g-h). The larger specimen is polished along several edges and may have functioned as a scraper rather than a point. The smaller item does not exhibit wear and may be a practice point or a toy. Of the four pecked stone tools, two are hammer/anvil combinations with well patterned battering on the ends and on at least one face. A quartzite hammer and broken hammer/chopper fragment were also recovered. The broken chopper has well patterned bifacial flaking along the entire working edge. The edge is rounded and given the brittle nature of the lithic material (limestone), Ramsay (1993:143) suggests that it may have functioned as a digging tool.

The assemblage of lithic debitage from Layer 12 is dominated by Swan River chert (64%; n=1077) (Ramsay 1993:103). Quartzite, crystalline quartz, silicified siltstone, and brown chalcedony are also common. Exotics are represented by nine flakes of Tongue River silicified sediment and hint at a possible trade link to the south.

Identified features include eight concentrations of charcoal, six hearths, and two pits. Eleven of these (all of the hearths and five of the charcoal concentrations) are clustered among a circular pattern of lithic and faunal debris that measures approximately 4.75 meters by 3.5 meters. The pattern is similar to the debris cluster described in Layer 11 and may outline the position of a temporary habitation structure. One of the pits (feature 4) is basin shaped and appears to have functioned as a midden. Fill from this feature included lithic debitage, broken tools, fire broken rock, and bone fragments (both raw and burned). A flotation sample from this feature also produced six *Chenopodium* seeds (Ramsay 1993:223).

The faunal assemblage includes specimens from bison, canids, a leporid, several rodents, a frog or toad, a fish, and several mollusk species (Ramsay 1993:157). At least two bison were identified and include a mature individual and a calf approximately 7 months of age. Given the relatively tight birthing schedule of bison, a late fall to early winter occupation is inferred. Three canids were identified including two wolf-sized animals and a red fox. There are two elements from a leporid and they are most likely from a jackrabbit (*Lepus townsendii*). Five rodent species were also identified in Layer 12. The rodents, fish, frog, and mollusk specimens do not exhibit signs of cultural modification and the cultural use of these species seems impossible to confirm or deny (Ramsay 1993:180).

Artifact distributions indicate the presence of several activity areas. Lithic debitage, fire broken rock, faunal remains, and tools are clustered along the southern end of the possible habitation structure. The midden area is outside of this feature (approximately 2 meters to the southeast). The midden 'pit' may have initially functioned as a hearth or boiling pit and was later in-filled with a variety of debris. Interestingly 17 of the 20 cores and 13 of the 22 tools from this assemblage were found within or directly around this feature (Ramsay 1993:289). Activities in Layer 12 include primary lithic reduction, tool manufacture and food processing. Similar activities are indicated in Layer 11 although the amount of debris in Layer 12 is considerably larger and may indicate a longer period of occupation. With the exception of the midden area much of the debris is located within the circular debris pattern as might be expected in a late fall to early winter campsite.

Layer 13; Occupation 13(1)

A relatively small assemblage of artifacts was recovered from Occupation 13(1). No diagnostic tools have been identified and radiocarbon samples were not submitted. Layers immediately above and below contain diagnostic projectile points with acceptable radiocarbon dates and both are attributed to McKean. Furthermore, Occupations 13(1) and 13(2) are extremely close together in the stratigraphic profile and at times were difficult to separate. Given this information Occupation 13(1) is assumed to be representative of McKean as well.

While few tools were recovered from this level, cores are relatively common. Eleven cores were identified and include bipolar, unifacial and bifacial types. Ramsay (1993:109) identifies one of the items as a split pebble core and suggests that it is similar in morphology to Brumley's (1975) pièces esquillées. Battering at both ends of the specimen suggests that the primary use was as a wedge and not as a core.

The remaining tool assemblage includes a hafted biface, a biface fragment, a MURL, and a grooved abrader. The hafted biface is complete (Figure 2.9:a) and the basal configuration is somewhat reminiscent of the Hanna style. There is slight wear along the edges and, like the item in Layer 12, it may have functioned as a hafted knife or as the tip of a thrusting spear. The abrader is made from coarse sandstone and has a well-worn asymmetrical groove along the center of one face (Figure 2.9:b). The item may have functioned as a shaft smoother although Ramsay (1993:143) prefers the interpretation that the item was used to sharpen antler and bone flaking tools.

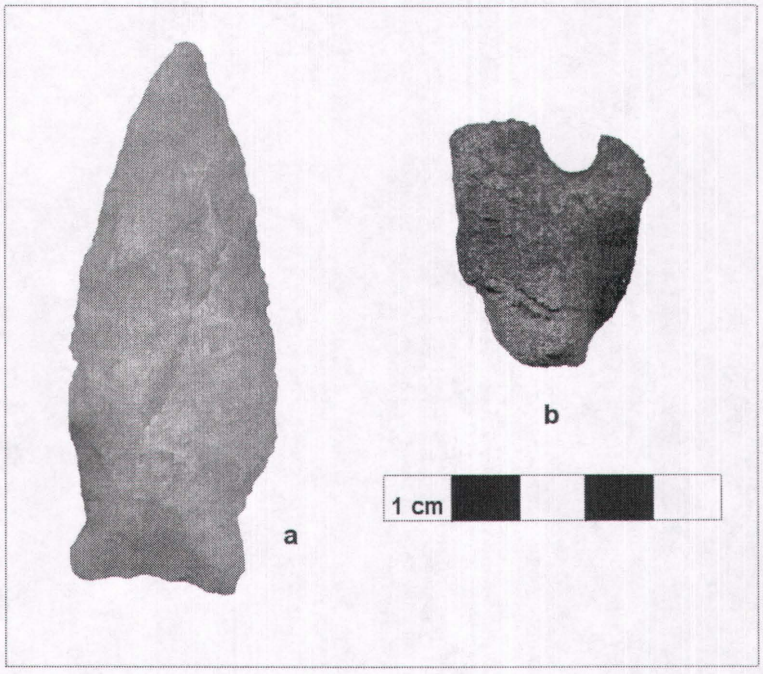

Figure 2.9. Hafted Biface (a) and Grooved Abrader (b) from Occupation 13(1) at the Redtail Site.

The faunal assemblage includes specimens from at least three bison. Two of the individuals are mature adults and both a male and a female are represented. Several elements from an immature individual were also recovered. The overall size of the specimens indicates an approximate age of between 2-3 months. Elements from two rodents and a passerine bird (likely a robin) were also identified but do not appear to have been culturally modified (Ramsay 1993:264).

Five features were identified and include two surface hearths, two charcoal concentrations and a debris filled pit. There are several concentrations of bone and lithic debitage near the hearths. The abrader, bifaces and MURL were associated with the hearths, as were 8 of the 11 cores. Primary activities include core reduction, tool rejuvenation and food preparation. Several meters to the east there is a second activity area associated with the pit feature. The primary function of the pit appears to have been food preparation and numerous raw and burned bone fragments were recovered from the fill. The upper layer of the feature contained more lithic debris and fire broken rock suggesting that the pit was later covered with debris. At present Occupation 13(1) is best interpreted as a short-term campsite. The presence of an immature bison that is 2-3 months of age indicates a summer habitation (Ramsay 1993:290).

Layer 13; Occupation 13(2)

This level is very similar in composition to Occupation 13(1). Two radiocarbon dates were submitted (see Table 2.2) and are extremely close in age. Both of the projectile points recovered from this layer are characteristic of McKean. The first (Figure 2.10:a) is identified as the base of a McKean Lanceolate point. It has a slight basal concavity with "squared" corners and lateral margins that expand away from the base. The second point (Figure 2.10:b) also has a slight basal concavity but the corners are more rounded in appearance. The stem is straight and the right lateral edge expands slightly into what appears to be a gentle shoulder. Ramsay (1993:117) suggests that the point is similar in style to Duncan but may also represent a slightly constricted McKean Lanceolate point. I prefer the former interpretation given the differences in the basal corners and the obvious stem. It is entirely possible that the Duncan point is associated with Occupation 13(1). The assemblages from Occupations 13(1) and 13(2) were difficult to separate in the stratigraphy and Ramsay (1993:195-196) notes that the close association of these levels has undoubtedly led to mixing of artifacts between occupations.

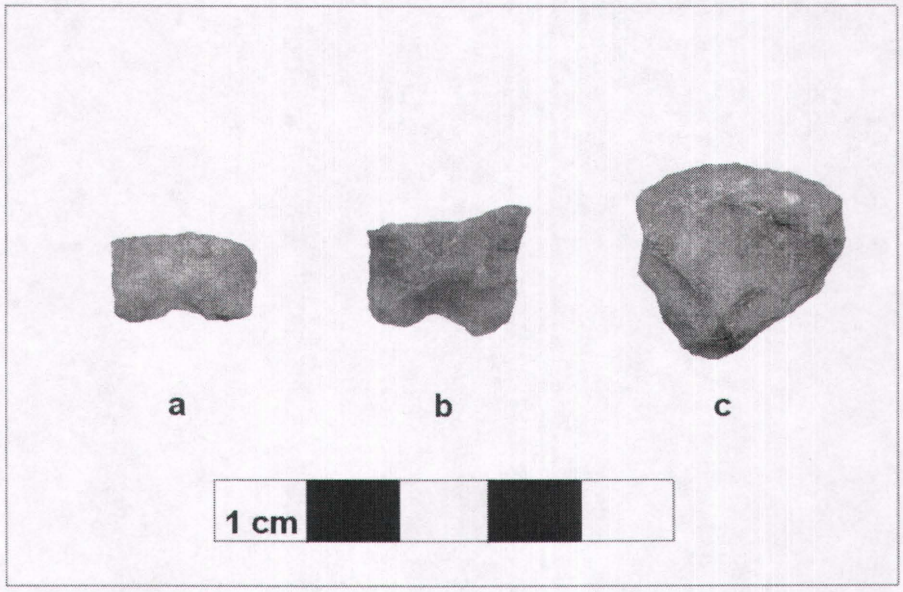

Figure 2.10. Projectile Points (a-b) and an Endscraper (c) from Occupation 13(2) at the Redtail Site.

The remaining tool assemblage includes a pointed biface fragment, a uniface, four MURLs, a modified mammal rib, a possible grinding stone (metate), and six cores. All of the tools (with the exception of the grinding stone and five of the cores) are made from Swan River chert. The uniface has steep angled retouch along the distal end and appears to have functioned as an end scraper (Figure 2.10:c). All of the MURLs are retouched flakes. Two of these were originally identified as unifaces, however, they exhibit minor unifacial retouch and there is little evidence for use. The distal edge of a third flake has been retouched to form a sharp point and was likely used as a graver or perforator. The fourth is slightly serrated and may have been used as a cutting tool.

Two rib fragments have been re-fitted to form a possible bone tool. There is evidence of scoring on one surface and the end of the specimen has been smoothed. The fragment is heavily weathered and the function is unknown.

The possible grinding stone is constructed from a gneiss cobble (see Ramsay 1993; Figure 5.11). There is a smoothed and polished surface measuring 4.7 x 4.5 cm on one side of the cobble (Ramsay 1993:143). This may be the second grinding stone associated with the McKean occupations.

As mentioned, nearly all of the tools (including the projectile points) are made from Swan River chert. Only one Swan River chert core was recovered in Occupation 13(2) indicating that most of the tools were produced elsewhere or were created from bifacial blanks. Three of the cores are silicified peat and two more are from an indeterminate chert. Five of the cores show evidence of bifacial flake removal while the sixth appears to be bipolar.

The faunal assemblage is relatively small but includes a variety of identified species including three bison, a canid, two leporids (*Lepus townsendii and Lepus americanus*), a mustelid (*Mustela vison*), two rodents (*Thomomys talpoides and Clethrionomys gapperi*), and a frog or a toad. Much like Occupation 13(1) the bison from this level include a mature male, a mature female and an immature individual. The immature elements are heavily weathered and could not be used to determine an approximate age. Specimens from the leporids are numerous (45) and appear to have been utilized for food. There is no evidence for cultural modification on the elements from the rodents or the frog/toad. The canid and the mustelid are represented by individual teeth and their cultural significance is difficult to assess.

Five features were excavated in Occupation 13(2) including two surface hearths, two concentrations of charcoal and a basin-shaped hearth. All of the features are clustered together in a semi-circular pattern that is approximately 3 metres in diameter. Bone, lithic debitage, fire broken rock, and a number of the tools are clustered around the features and are associated with activities such as lithic production, tool manufacture and food processing. Sediment from one of the hearths (Feature 7) was submitted for flotation analysis and yielded three identifiable seeds and five seed fragments. The seeds are interpreted as potential food items (Ramsay 1993:291) and include *Potentilla sp* (cinquefoil), *Rosa sp* (rose), and *Iva sp* (marshelder). The grinding base was located within 50 centimeters of Feature 7 and may have been used to process seeds or meat.

Layer 13; Occupation 13(3)

Occupation 13(3) contained the lowest number of artifacts of the McKean occupations. Diagnostic artifacts were not recovered and no radiocarbon dates were obtained. As with Occupation 13(1), this level is assumed to represent a McKean occupation since McKean Lanceolate points were found in levels both above and below this assemblage. Tools are limited to three cores and a broken biface. Two of the cores are bipolar and have been made from a pebble chert. The third is a large siltstone cobble core. The broken biface is pointed and has evidence of use wear along the lateral margins. This item may have been a bifacial preform that was later used as a knife, since most of the use wear appears to have occurred after breakage.

Faunal specimens are also relatively rare (n=351) and represent two bison, a canid and two rodents (Ramsay 1993:162). Longbone measurements indicate that one of the bison is a mature female. A single element from an immature bison of unknown age was also recovered. The canid elements include two tarsals that are similar in size to a coyote or a small dog. Both of these are burned and may indicate the use of canids as a food resource. Elements from a Richardson's ground squirrel (*Spermophilus richardsonii*) and a least chipmunk (*Eutamias minimus*) were also recovered and are not believed to be cultural.

A single surface hearth was recorded in Occupation 13(3). Artifacts are sparse but are clearly distributed around the hearth. The small amount of debitage recovered indicates that lithic reduction and possibly tool rejuvenation were primary activities. The presence of raw and burned bone fragments within the hearth also indicates food preparation. A second activity area (several meters to the west of the feature) may be

indicated by the presence of fire broken rock, lithic debris and charcoal; or could represent a pile of debris resulting from hearth maintenance. Whatever the case, the occupation of this level appears to have been very short-term and limited to a small number of people.

Layer 13; Occupation 13(4)

This is the last of the confirmed McKean occupations. A radiocarbon date of 4280±80 rcybp (S-3009; cal 5285 [4870] 4826) is one of the earliest McKean dates in Saskatchewan. Two projectile points were recovered from this layer and both are identified as the McKean Lanceolate type. The first is complete (Figure 2.11:a) and has a deep and wide basal notch. The basal corners are squared and the body is lanceolate in shape. The point has been re-worked and may have been considerably longer. The second point (Figure 2.11:b) is missing the tip but is otherwise complete, although poorly crafted. This specimen also has a relatively deep basal concavity that is slightly more "v-shaped" than that of the previous specimen. The basal corners are rounded rather than squared. Both of the points are made from Swan River chert.

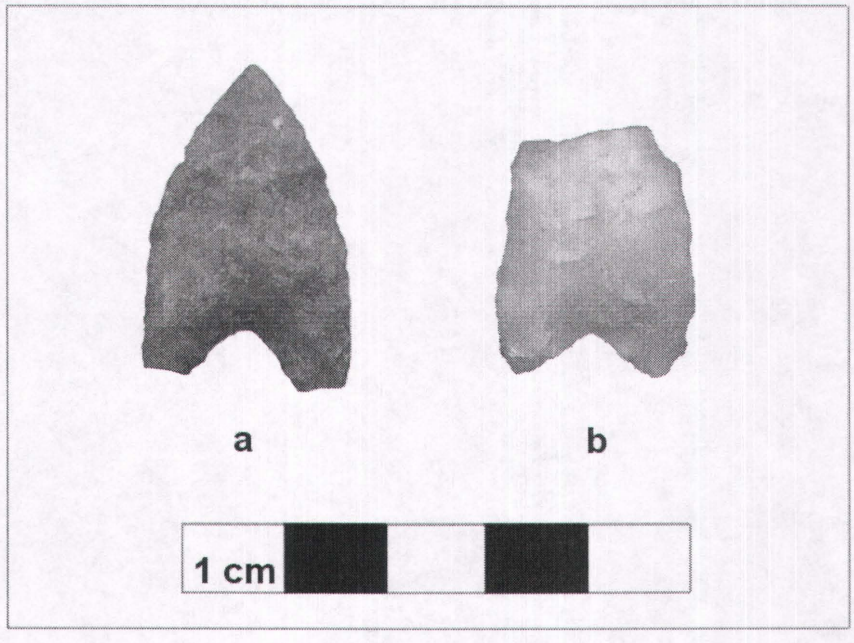

Figure 2.11. McKean Lanceolate Points (a-b) from Occupation 13(4) at the Redtail Site.

Other recovered lithic tools include three cores, two biface fragments and two pecked stone tools. Two of the cores are Swan River chert and the other is crystalline quartz. The biface fragments include an edge fragment and a base fragment. The edge fragment is made from crystalline quartz while the basal fragment is Swan River chert. Pecked stone tools include a complete hammerstone and a fragment of a hammerstone or chopper.

Occupation 13(4) contained the smallest faunal assemblage of all of the McKean occupations (303 specimens) (Ramsay 1993:157). Identified elements represent two bison, two birds and three rodents. The bison include one mature individual of unknown gender and an immature individual that is approximately one month old. The presence of the calf indicates that the site was occupied in late spring or early summer. Two elements have been identified from a crow (*Corvus brachyrhynchos*) and two more from a mallard duck (*Anas platyrhynchos*). Identified rodents include Gapper's red-backed vole (*Clethrionomys gapperi*), prairie vole (*Microtus ochrogaster*) and a deer mouse (*Peromyscus maniculatus*). None of the bird or rodent remains revealed evidence of cultural modification (Ramsay 1993:181-184).

Three features were discovered in Occupation 13(4) and all are identified as surface hearths. Two of the hearths are clustered together with a small concentration of bone fragments and fire broken rock. A larger hearth is located approximately 3 meters to the west of this cluster and is also associated with fire broken rock and bone. Lithic debitage is scattered around all of the features (Ramsay 1993:272). Sediment samples from the larger feature (Feature 6) were submitted for flotation analysis yielding seeds from *Chenopodium* (n=7) and *Rosa* (n=3). A fragment of a nutshell was also recovered and may be from a hazelnut (*Corylus curnuta*) (Ramsay 1993:237).

Artifact counts and distribution patterns suggest that Occupation 13(4) represents a short-term campsite. Small secondary flakes are relatively numerous and indicate that bifacial thinning is a primary activity. Portions of several bison were cooked in the hearths and both birds and seeds may also have been used as a food resource.

Summary

At least seven McKean occupations have been identified at the Redtail site. Further investigation of layers immediately above and below these occupations may also yield McKean diagnostics. An examination of the projectile points from these levels reveals a change in style through time. Occupations 13(2) and 13(4) are

associated with McKean Lanceolate points. A Duncan point is associated with the upper occupations of Layer 13 (1 or 2) but could not be assigned to a specific level due to artifact mixing in the area of recovery. A Hanna-like biface was identified in Occupation 13(1), but diagnostic projectile points were not recovered. Layers 11 and 12 contain typically Hanna style projectile points.

All of the recovered tools have been made from local lithic materials and Swan River chert is clearly preferred. Several flakes of Tongue River silicified sediment were identified in Layer 12 and represent the only exotics recovered to date.

Artifact frequency and distribution patterns indicate that the occupations functioned primarily as short-term campsites. Five of the components are either known or are suspected to have been inhabited in the spring/summer. Layer 12 contains the most cultural material and may have been occupied for a longer period, not surprising since this is the only confirmed late fall or early winter occupation. Activities in all of the levels clearly revolved around a number of hearths and midden features. Hearths tend to be of the shallow surface variety although several basin-shaped features were also recorded. Primary activities included core reduction, tool manufacture, tool rejuvenation, and food preparation. The lack of stone boiling features (with the exception of a single rock-filled pit in Layer 12) indicates that the manufacture of bone grease was not a primary activity. Faunal assemblages include small numbers of bison, canids and occasionally leporids. Several birds and small mustelids may have also been procured.

Seeds were identified in hearth samples from four separate occupations. Identified taxa include: *Chenopodium*, *Potentilla*, *Prunus*, *Rosa*, *Symphoricarpos*, *Iva*, and likely *Corylus curnuta*. Most of these represent potential food items. Interestingly, the highest number of seeds was recorded in a hearth from Layer 11 and the feature is also associated with a possible grinding stone. What appears to be another grinding stone was also associated with seeds and faunal remains in Occupation 13(2).

The outline of two temporary habitation structures may be present in Layers 11 and 12. In both cases artifacts and features are clustered in a circular pattern. Lithic debitage, fire broken rock, and faunal remains tend to be clustered in the southern half of the circle. This pattern is also reflected at the Cactus Flower site where artifacts appear clustered in the southern and southeastern margins of a circular debris pattern (see Brumley 1975:139).

2.2.2 The Thundercloud Site (FbNp-25):

The Thundercloud site is located on the floor of Opimihaw Valley, approximately 720 meters north of the South Saskatchewan River (Figure 2.6:4). Artifacts are centered on a point bar to the immediate east of Opimihaw Creek. The site was used as a location for the archaeological field school from the University of Saskatchewan over a period of six summers (1993 to 1998). During this time students excavated an area of 44.5 square meters to a maximum depth of 120 centimeters below the ground surface. Artifacts recovered from the first five field seasons (1993-1997) have been analyzed and form the basis for two Master of Arts theses (Mack 2000; Webster 1999). Artifacts from the 1998 season require further analysis, but many of the diagnostic artifacts are included here.

Initial investigation of the site began on the upslope portion of the terrace and revealed the presence of six cultural occupations. Excavation units placed closer to the creek margins revealed a more complex stratigraphic sequence as a result of increased sedimentation due to overbank flooding. In these areas researchers identified as many as seven buried soil horizons containing at least 11 cultural occupations.

All but one of the levels contained diagnostic projectile points, although several included a mixture of point styles. Levels 1 and 2 are located immediately below the sod and were found within a single broad soil horizon. Cultural artifacts from Level 1 include four different projectile point varieties: metal, Plains Triangular, Plains Side-Notched, and Prairie Side-Notched. Identified point styles from Level 2 include Plains Triangular, Plains Side-Notched, Prairie Side-Notched, and Avonlea Triangular. Level 3 contains at least two identified occupations associated with both Avonlea and Besant. Level 4 was initially thought to represent a McKean occupation due to the close association of artifacts from this level to those from Level 5. A newly recorded radiocarbon date of 2570±50 rcybp (BGS-2370; cal 2918 [2779] 2746) and the recent identification of a single Pelican Lake point indicate a later occupation. Level 5 contains at least three occupations and all are associated with McKean. Point varieties include McKean Lanceolate, Duncan and Hanna. Radiocarbon dates have been submitted from each of the McKean occupations and are provided in Table 2.4. Level 6 includes two occupations, both containing artifacts from the Oxbow Complex. Level 7 was heavily eroded and lacked culturally diagnostic materials.

Table 2.4. McKean Radiocarbon Dates from the Thundercloud Site.

Occupation		Radiocarbon Age		Lab Number	Assoc. Projectile Points
	Calculated Age	Normalized Age	Calibrated Age*		
5a	3150±50	3172±50	3472-3267 BP	BGS-2369	Hanna
5b	3315±50	3375±50	3808-3471 BP	BGS-2367	Duncan
5b	Not Available	3382±55 (AMS)	3824-3472 BP	NZA-15749	Duncan
5c	4040±90	4145±90	4865-4419 BP	S-3645	McKean/Duncan?

* Based on the 2 Sigma calibration from intercepts (calibration source Stuiver and Reimer 2000, CALIB 4.3).

Level 5; Occupations 5a, 5b, and 5c

In the majority of the excavated units artifacts associated with Level 5 were located in a single buried soil horizon approximately 10 centimeters in thickness. In six of the excavation units the soil horizon divided into three distinct paleosols delineating the three separate occupations. Four of these units were excavated in 1998 and were not included in the original analyses (Mack 2000; Webster 1999). As a result, initial interpretations summarized all of the materials as a single cultural assemblage. Further excavation will be necessary before the exact nature of each occupation can be described. The following summary relies heavily on previous work and as a result, Level 5 must be considered a mixed assemblage of McKean complex artifacts. Still, a recent examination of the materials recovered in 1998 has led to the discovery of several differences between these occupations. Furthermore, an analysis of artifact depth in the units from the western half of the excavation allows for the assignment of radiocarbon dates and diagnostic projectile points to each of the occupations within the McKean component (see Table 2.4).

A total of 13 projectile points have been recovered from Level 5. Three of these are projectile point fragments that lack basal margins necessary for accurate identification. All of the identifiable projectile points are diagnostic of McKean and include four McKean Lanceolate, four Duncan, and two Hanna points (Figure 2.12). Three of the four McKean Lanceolate points were found in the bottom portion of the buried soil horizon and are associated with Occupation 5c. The fourth (Figure 2.12:a) was found at a depth of 22 centimeters below the surface (Level 3) in association with a Besant stone-boiling pit. The pit extended well into Levels 4 and 5 and the point has been re-deposited as a result of digging the pit. One of the McKean Lanceolate points (Figure 2.12:d) has been extensively re-worked along the left lateral edge mirroring the appearance of a stem.

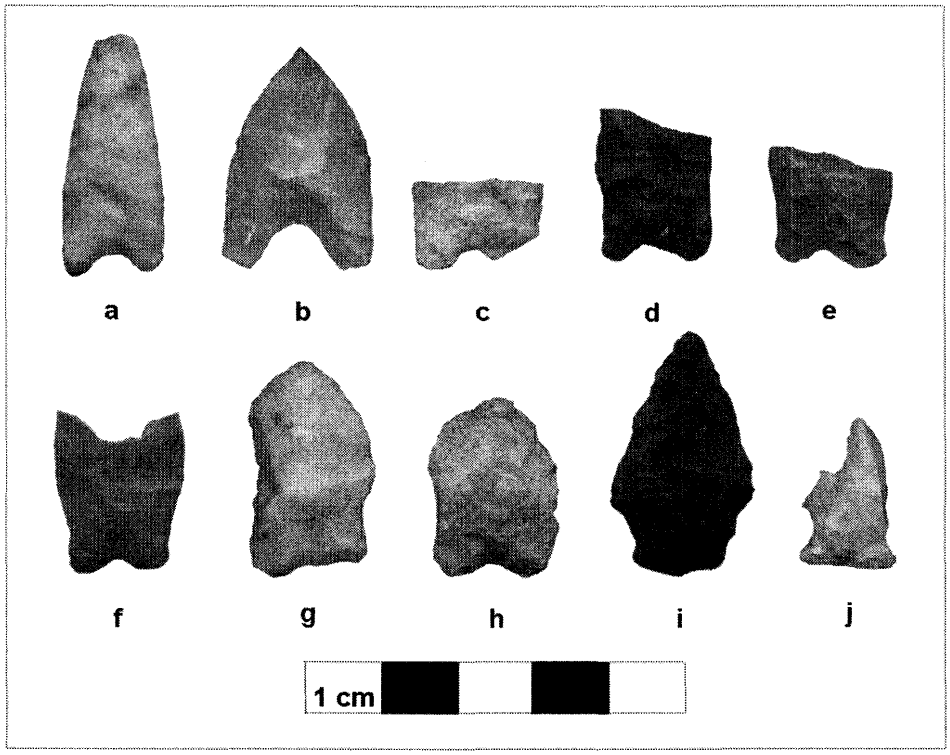

Figure 2.12. McKean Lanceolate (a-d), Duncan (e-h) and Hanna (i-j) Projectile Points from Level 5 at the Thundercloud Site.

The Duncan points were found at varying depths. Two of the specimens (Figure 2.12:e-f) were found in sediments between Occupations 5b and 5c, but are closer in depth to the 5b assemblage. It appears that several artifacts in this excavation unit have been slightly displaced due to the activities of burrowing rodents. A third point (Figure 2.12:g) was found in direct association with Occupation 5b and exhibits a large longitudinal fracture along the left lateral edge. The fourth Duncan point was in the process of being re-worked, however, flaws in the material along the right lateral edge and distal margins prevented further thinning and re-shaping. This specimen was recovered from a unit with compacted stratigraphy and could not be assigned to a specific cultural occupation within Level 5.

The Hanna points were found in direct association with Occupation 5a. One of the specimens is relatively complete (Figure 2.12:i), although a portion of the stem appears to have broken during manufacture. Notches are broad and terminate in definite shoulders. The point is poorly finished and may have been discarded prior to use. The second Hanna point (Figure 2.12:j) seems to have fractured, been re-worked, and then fractured again. The base is straight with broad notches that terminate in definite shoulders.

All of the points are constructed from local lithic materials. Eight of the specimens are made from Swan River chert, three from silicified siltstone, one from fused shale, and one from an unidentified chert. At least seven of the points have been re-worked and have been considerably reduced in length.

The remaining tool assemblage includes four bifacial knives, three ovate bifaces (likely preforms), a perforator, a drill, six endscrapers, two unifaces, three cores, several MURLs, and two bone tools. Most of these items are constructed from Swan River chert although quartzite, siltstone, silicified peat, and silicified wood are also represented. Both of the bone tools are broken and their function is unknown. One has a rounded and polished end and may have been used as a small spatula. A Knife River chalcedony endscraper represents the only tool constructed from an exotic lithic material. The drill has been heavily re-worked and exhibits a basal configuration similar to the Hanna points.

Most of the tools were found in the eastern excavation units and cannot adequately be separated into individual occupations. One of the bifacial knives is associated with a Hanna projectile point and is from Occupation 5a. The perforator, two unifaces and an endscraper were directly associated with Occupation 5c.

Tertiary finishing and retouch flakes are very common in Level 5 (77% of the recovered lithic debitage; n=1751). Secondary flakes are also relatively common (16.1%; n=364) and many of these are small retouch or finishing flakes (Mack 2000:181). The high proportion of small secondary and tertiary flakes is indicative of tool rejuvenation and possibly tool finishing. The dominant lithic material is chert (72.5%; n=1649) of which 38% (n=869) is comprised of Swan River chert (Mack 2000:180). Quartzite, crystalline quartz and siltstone are also commonly used. Exotic materials include Knife River chalcedony, jasper and obsidian although jasper and obsidian are represented in extremely small quantities (a total of 11 small flakes; Mack 2000:181).

Mack (2000:183-185) separates some of the lithic debitage by occupation level. Occupation 5a is a small assemblage with the least amount of lithic debitage of the three occupations. Many of the flakes are represented by indeterminate chert varieties (40.9%; n=18) followed by Swan River chert and crystalline quartz. Occupation 5b is also a small assemblage. Chert varieties are more heavily utilized in this occupation including both indeterminate chert (66%; n=80) and Swan River chert (12.4%; n=15). Siltstone (14%; n=17) is also relatively well represented. Artifacts in Occupation 5c are

more numerous and more dense than in Occupations 5a and 5b and may indicate a longer period of habitation. The lithic assemblage is markedly different and much of the debitage is identified as Swan River chert (84.7%; n=227). A single flake of indeterminate chert suggests a definite difference in patterns of lithic procurement. Quartzite and siltstone are utilized to a greater extent than the previous assemblages. The presence of small amounts of jasper, obsidian and Knife River chalcedony (a total of nine flakes) may also indicate a greater reliance on exotic materials although the sample is extremely small.

Faunal remains recovered from 1993 to 1997 have been summarized previously (Webster 1999) but could not be separated by occupation layer. A re-examination of the faunal assemblage from some of the western excavation units has revealed some general differences between the occupations, however, further excavation and analysis will be required before specific patterns can be assigned to the individual occupation layers.

The Level 5 faunal assemblage is well preserved leading to the recovery of 22,666 specimens weighing 34.53 kilograms. Of these, 3447 of the specimens are identifiable representing a minimum of 24 taxa (Webster 1999:138). These taxa include at least 17 species of mammals, four species of birds, one toad, and three species of mollusk (see Appendix C, Table C.2). Bison elements are the most numerous and represent eight individuals. Two immature bison were identified and include an individual that is seven to ten-months of age and another that is three weeks old. The data indicate two periods of occupation; one in the winter associated with Occupation 5a and another in the spring associated with Occupation 5c. Seasonal indicators have not been recovered from Occupation 5b.

Cut marks, impact fractures and burning are present on elements from the following species: several bison (*Bison bison*), a wolf (*Canis lupus*), a badger (*Taxidea taxus*), a skunk (*Mephitis mephitis*), a Nuttall's cottontail (*Sylvilagus nuttallii*), several rodents (*Microtus* sp.), and a toad (*Bufo* sp.). Two burned seeds, one chokecherry (*Prunus virginiana*) and one rose (*Rosa* sp.), were also recovered from fine-screen samples (Webster 1999:159). Bison is clearly the most important food resource, but the presence of a large number of utilized species indicates that the diet was supplemented by a variety of fauna (and possibly flora).

A total of nine features were recorded in Level 5 and include six surface hearths, a large basin-shaped hearth, a bone concentration, and an organic stain. The

majority of the hearths are quite large (between 80-100 centimeters at the widest point). Surface hearths are shallow (2-4 centimeters in depth) and are underlain by oxidized soil. The large basin-shaped hearth slopes gently towards the center with a maximum depth of 13 centimeters. The underlying matrix shows no signs of oxidation and a layer of fire broken rock was recovered from the bottom of the feature. Artifacts on the surface of the hearth include hundreds of fragments of burned, calcined and raw bone. Elements from a hare (*Lepus* sp.) and a medium sized bird (likely a grouse) were also recovered. Fire broken rock is not particularly abundant and it does not appear that the feature was used as a boiling pit. It is possible that the feature was partially lined with rock leading to the recorded configuration of artifacts.

Many of the faunal specimens from Level 5 are quite large and there are few impact fractures. These data, combined with the lack of stone boiling features, indicate that the production of bone grease was of minor importance at this site (Webster 1999:167). One of the hearths (Feature 5-8) is associated with numerous specimens from a bison as well as a small collection of burned elements from several rodent species, a frog or a toad, a small bird, and numerous unidentified small vertebrates. The bison elements were not burned and are distributed around the margins of the hearth, while the small animal remains were recovered from within the hearth sediments. It appears that the site occupants may have roasted a number of small mammals while at the same time processing several bison limbs.

Faunal and lithic assemblages from Occupations 5a and 5b are much smaller than those recovered from Occupation 5c. Using the small amount of data from available distribution patterns it appears that the later occupations represent smaller campsites similar to many of the Redtail occupations. Regardless, distribution patterns indicate that all of the activities in Level 5 are centered around hearth features. Many of these faunal elements are located in the bottom portion of the buried soil horizon or, in the case of units placed closer to the creek, are in direct association with Occupation 5c. Few of the elements are burned and butchering patterns indicate that secondary dismemberment and removal of marrow are the primary activities. The presence of a large number of minimally processed faunal elements (both axial and appendicular) suggests a close proximity to the kill site, although a McKean kill has yet to be identified at Wanuskewin. Lithic debitage reveals a similar distribution to the bison elements. As mentioned, much of the debris has been attributed to tool rejuvenation (Mack 2000:195).

Summary

Three McKean occupations have been identified at the Thundercloud site. The oldest occupation is associated with McKean Lanceolate projectile points. Occupation 5b contains Duncan projectile points while Occupation 5a is associated with Hanna. A similar separation of McKean Lanceolate, Duncan and Hanna was recorded at the Redtail Site.

Lithic materials are predominantly local although small quantities of jasper, obsidian, and Knife River chalcedony were also recovered. Most of the exotic specimens, including one tool, are associated with Occupation 5c. Small secondary and tertiary flakes indicative of tool re-sharpening and tool finishing represent much of the lithic debitage. There is a definite shift from the use of Swan River chert in the earlier occupation to a heavier reliance on indeterminate chert varieties and crystalline quartz in Occupations 5a and 5b.

Faunal remains are most numerous in Occupation 5c and hint at activities associated with secondary butchering of bison. A lack of boiling pits is significant given the apparent nature of the assemblage and it seems that methods used to produce pemmican were either unknown or were not a primary concern of the site occupants. Occupations 5a and 5b are better described as temporary campsites. One of these (Occupation 5a) appears to be a winter campsite. In all of the occupations, activities are patterned around a number of shallow hearth features. Bone fragments recovered from the features indicate that bison, as well as a number of small and medium-sized mammals, were being processed for immediate consumption.

2.2.3 The Cut Arm Site (FbNp-22):

The Cut Arm site is located in a gently sloping drainage near the mouth of Opimihaw Creek (Figure 2.6:3). The setting is similar to the Redtail site, although artifacts are spread over a much larger area of the drainage. Much like other sites at Wanuskewin, the Cut Arm site was excavated as part of the active field school program run by the University of Saskatchewan. Artifacts that were recovered from the site are currently being analyzed by a graduate student from the Department of Archaeology.

A total of 12 occupations have been identified at Cut Arm. Buried soil horizons are well separated by slope-wash providing a deep sequence of cultural deposits. Artifacts near the surface appear to have been deposited around the time of European contact. One of the deepest levels (Level 11) is associated with a Mummy Cave series projectile point and, at present, is the oldest recorded occupation at Wanuskewin

Heritage Park. Artifacts from Level 8 are of interest to the present study and include at least two occupations that can be attributed to McKean.

The upper occupation in Level 8 contained a large amount of bison bone in association with a McKean Lanceolate projectile point. The bison elements are relatively complete and include a concentration of ribs and thoracic vertebrae, some recovered in articulation. One of these elements provided a radiocarbon date of 3387±50 rcybp (BGS-2383; cal 3832 [3690] 3570). Initial analysis indicates that the occupation may represent a small scale processing area. Much like Level 5c at the Thundercloud site, the accumulation of both axial and appendicular elements may indicate a close proximity to the kill area. The presence of a radius from a week old bison suggests that these activities occurred in the spring (Jace Moon, personal communication 2003).

The lower occupation is not associated with a diagnostic point, but is assigned to McKean based on the close association of the occupations and a radiocarbon date of 3448±60 rcybp (BGS-2384; cal 3975 [3828,3788,3778,3734,3734] 3638). This assemblage includes a small amount of lithic debitage and broken faunal remains in association with a shallow hearth. Lithic debitage was recovered in an area immediately surrounding the hearth. Small secondary and tertiary flakes are very common and most are made from Swan River chert. A number of small crystalline quartz tertiary flakes were also recovered. The limited faunal assemblage does not provide enough evidence to determine season of occupation, however, available artifact distributions indicate the presence of a short-term campsite. Primary activities include meal preparation and tool finishing and/or re-sharpening (Jace Moon, personal communication 2003).

2.2.4 The Meewasin Site (FbNp-9):

The Meewasin site is located in a steep drainage situated immediately between the Redtail and Cut Arm sites (Figure 2.6:2). Much of the site area is situated in a shallow depression at the base of the drainage. The archaeological field school at the University of Saskatchewan also excavated the Meewasin site and analyses are currently being conducted on the recovered site materials.

In total, nine occupations have been identified at the Meewasin site and at least one of these (occupation 4b) has yielded a McKean Lanceolate projectile point. Several tools were also recovered and include a broken biface, a uniface, several scrapers, several cores, and a relatively large number of flakes. Lithic materials are

predominantly local, however, exotics such as agate and Knife River chalcedony have also been identified (Yvonne Ramey, personal communication 2003).

Three features have been identified in the McKean occupation and include a small basin-shaped hearth, an associated spill area, and a large flake concentration. The flaking station is clearly associated with the hearth and consists of hundreds of small finishing/rejuvenation flakes. Unfortunately faunal materials are poorly preserved and only two elements could be identified to species (a talus and mandible from a bison). Ramey (personal communication 2003) indicates that the occupation likely represents a temporary campsite where activities included tool finishing and meal preparation.

Part B: Published Data

2.3 McKean Components from Saskatchewan

Saskatchewan currently has the best record of excavated McKean components in the Canadian Plains. This is, in part, due to a focus on Middle Period research by several individuals at the University of Saskatchewan. Even so, McKean projectile points are relatively common in Saskatchewan as indicated by several large surveys of regional collections (Himour 1997; Novecosky 2002). Many of the excavated components are located at Wanuskewin Heritage Park and have been discussed in the opening portion of this chapter. The only remaining multi-component site that has yet to be discussed is the Crown site. Although no less significant, the remaining components are represented by single assemblages or significantly large surface collections.

2.3.1 The Crown Site (FhNa-86)

Crown is one of many sites that were discovered during the Nipawin Reservoir Heritage Study, a CRM project conducted in advance of the construction of a hydroelectric dam in east-central Saskatchewan. The site is located on a narrow terrace of an unnamed creek that flows northward into the Saskatchewan River (Figure 2.13:15). The site is at the southern edge of the boreal forest and the margin of the forest/parkland is some 30 to 50 kilometers south of the site area (Quigg 1986). Excavation of the site began in 1982 and was completed in 1984. Initially, two main blocks were excavated including 19 m^2 in the eastern block and 20 m^2 in the western block. These blocks were later expanded and at the end of the excavation in 1984 a

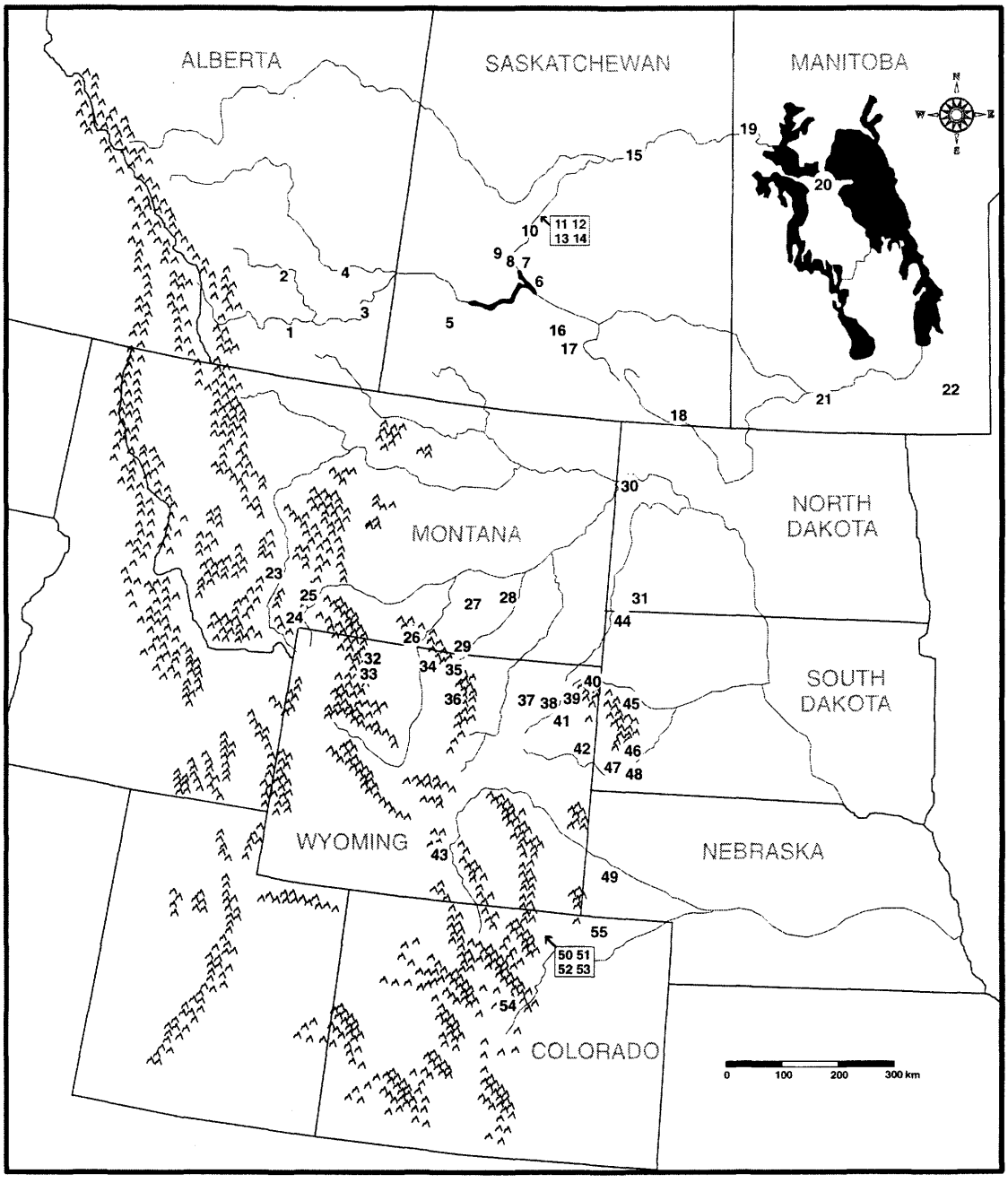

Figure 2.13. Location of McKean Sites in the Northern Plains. 1. Cranford (Stuart 1990); 2. Majorville Medicine Wheel (Calder 1977); 3. Cactus Flower (Brumley 1975;1978); 4. Saahkómaapína (Head et.al. 2003); 5. Gray Burial (Millar 1978); 6. EgNo-23; 7. Sullivan (Johnson 1975); 8. Sjovold (Dyck and Morlan 1995); 9. Billet (Dyck 1983); 10. Graham (Walker 1984);11. Redtail (Ramsay 1993); 12. Thundercloud (Webster 1999; Mack 2000); 13. Cut Arm; 14. Meewasin; 15. Crown (Quigg 1986); 16. Mortlach (Wettlaufer 1955); 17. Big Kill (Dyck 1983); 18. Long Creek (Wettlaufer and Mayer-Oakes 1960); 19. Pas Reserve (Tamplin 1977); 20. Tailrace Bay (Lukens 1967; Mayer-Oakes 1970); 21. United Church (Syms 1969); 22. Cemetery Point (Syms 1969); 23. Quinn Creek (Rennie and Hughes 1998); 24. Rigler Bluffs (Syms 1969); 25. Myers-Hindman (Lahren 1976); 26. Sorenson (Husted 1991); 27. 24RB1164 (Munson 1992); 28. Dodge (Davis 1976); 29. Benson's Butte (Fredlund 1979); 30. Mondrian Tree (Toom 1983); 31. Red Fox (Syms 1969); 32. Dead Indian Creek (Frison and Walker 1984); 33. Mummy Cave (Husted and Edgar 2002); 34. Bottleneck Cave (Husted 1991); 35. Granite Creek Rockshelter (Frison 1991); 36. Leigh Cave (Frison and Huseus 1968); 37. Cordero Mine (Reher et.al. 1985); 38. Belle Rockshelter (Wheeler 1996); 39. McKean (Mulloy 1954); 40. Red Canyon Rockshelter (Tratebas 1998); 41. Mule Creek Rockshelter (Wheeler 1996); 42. Lissolo Cave (Steege and Paulley 1964); 43. Scoggin (Lobdell 1974); 44. Lightning Spring (Keyser and Davis 1984; Davis and Keyser 1999); 45. Gant (Gant and Hurt 1965); 46. Beaver Creek Shelter (Tratebas 1998); 47. George Hey (Tratebas 1998); 48. Kolterman (Wheeler 1995); 49. Signal Butte (Strong 1935; Forbis 1985); 50. Pack Rat Rockshelter (Morris et.al. 1985); 51. Spring Gulch (Morris et.al. 1985); 52. Phoebe Rockshelter (Morris et.al. 1985); 53. Kinney Spring (Morris et.al. 1985); 54. LoDaisKa (Cassells 1997); 55. Dipper Gap (Metcalf 1974).

total of 92 m^2 had been excavated, although 21 of these included the Late Prehistoric component only (Quigg 1986:9).

The stratigraphy at the site is relatively complex and, in general, the buried soil horizons began to separate into more discrete occupation layers in the northern and western portions of the excavation (closer to the river). Three archaeological components were identified; an upper component located just below the sod that is associated with the Late Prehistoric Period, a middle component that includes the remnants of at least three Hanna occupations, and a lower component that includes at least three occupations with McKean Lanceolate projectile points (Quigg 1986:26-28). There was not enough deposition within these components to assign artifacts to individual occupations and as a result the assemblages within each component were analyzed together. Only materials from the Hanna and McKean Lanceolate components will be summarized here.

In total, eleven radiocarbon dates were obtained from the McKean components (Appendix C; Table C.5). Some of these dates do not appear to be in stratigraphic order, but most overlap at one sigma. Acceptable dates range from 3310±110 rcybp (S-2292; cal 3902 [3636] 3381) in the Hanna component to 4295±85 rcybp (S-2525; cal 5297 [4958,4936,4873] 4826) in the McKean Lanceolate component (Quigg 1986:32).

The McKean Lanceolate Component

Occupations associated with McKean Lanceolate points ranged in depth from 90-120 centimeters below the ground surface. They are separated from the upper Hanna component by a minimum of 20 centimeters of sterile deposits (Quigg 1986:23).

Sixteen projectile points were identified in the McKean component and seven of these are relatively complete (Quigg 1986:59). All of the points are identified as McKean Lanceolate and the majority are made from Swan River chert. Points are lanceolate in shape with a deep basal concavity and rounded basal margins. Several of the points appear to have been re-worked along one lateral edge. Re-worked points are no longer symmetrical and it is possible that they were used as bifacial knives.

The remaining tools include 21 bifaces, 14 scrapers, five unifaces, 44 MURLs, eight hammerstones, and four bone tools (Quigg 1986:63-77). Of the 21 bifaces, two are of the hafted variety. One of the specimens exhibits a straight base while the other is markedly convex. Both of the specimens have broad side-notches with an expanding stem. Bone tools include an elk antler pressure flaker, two hide working

tools and a small pointed fragment of bone that appears to have a fire-hardened tip (Quigg 1986:77-80). A fragment of a dentalium shell was also recovered in the McKean component and can be traced to similar species off the Pacific coast of British Columbia (Quigg 1986:89). While not a tool, the presence of this specimen indicates that trade links to the Pacific coast were well established in the Middle Middle Precontact Period.

Lithic debitage was numerous (4273 specimens) and over half consisted of Swan River chert. Quartzite was also well represented (19.8%) and both of the materials are available locally. Tertiary flakes and shatter dominate the lithic assemblage (78.4%). Based on the presence of several localized lithic concentrations, Quigg (1986:56) describes at least four activity areas associated with core reduction.

Fire-broken rock is limited in quantity and highly fragmented. Specimens were not associated with hearths leading Quigg (1986:53) to suggest the likely use of stone boiling features even though features of this type were not identified.

The faunal assemblage is represented by 5024 specimens, but many of these could not be identified to element. Three bison were identified and all were mature. The relatively high proportion of axial elements led Quigg (1986:91) to believe that the bison were killed near the site. Many of the bones were fractured to obtain marrow and possibly bone grease. Two elk (*Cervus elaphus*) were also identified (one adult, one juvenile) and all of the bone tools appear to have been made from elk bone or antler. Moose (*Alces alces*) is nearly as plentiful as bison and at least two individuals were identified (Quigg 1986:92). The foetal elements that were recovered could not be identified to species, but it was assumed that they represent bison. Given the presence of such elements, a winter habitation is inferred for at least two of the occupations (Quigg 1986:93).

The remainder of the identified faunal assemblage includes three canids, two beavers (*Castor canadensis*), a skunk (*Mephitis mephitis*), three hares (likely *Lepus americanus*), a sharp-tailed grouse (*Tympanuchus phasianellus*), numerous small mammals, several fish (of which one has been identified as a sucker; *Catostomus* sp.), and numerous clam shell fragments (Quigg 1986:80-92). Many of these specimens are burned, including bones from a grouse, rabbit and fish. Several of the canid elements were recovered in a hearth. It appears that several small animal species were used to supplement the diet; however, large artiodactyls supplied the bulk of the meat.

Three surface hearths were identified in the McKean component, as well as a small concentration of bone. One of the hearths was associated with a nearly complete dog skeleton and several endscrapers (Quigg 1986:47). The skeleton contains no evidence of butchery and the exact relationship between the skeleton, hearth and endscrapers is enigmatic. The distribution of all of the artifacts in the McKean component seems to indicate the presence of several small and temporary campsites (Quigg 1986:101). Primary activities include hide working, manufacture of tools, and food preparation.

The Hanna Component

At least three and possibly four Hanna occupations were identified at the Crown site. They were positioned between 20 to 60 cm below the surface in the eastern block and 20 to 45 cm below the surface in the western block. Much like the McKean component, the Hanna component was analyzed as a single unit.

A total of 118 tools were identified including projectile points, bifaces, unifaces, scrapers, hammerstones, MURL's, and three bone tools (Quigg 1986:118). Eight complete or nearly complete Hanna points and ten projectile point fragments were recovered. One complete Mummy Cave point and one Oxbow point were also identified (Quigg 1986:121). No Mummy Cave or Oxbow components were identified at the Crown site and it is possible that the points were collected elsewhere by the site inhabitants. The Hanna points exhibit minor stylistic variability but most of the specimens have distinct shoulders with an expanding stem. Bases are slightly concave or straight. One of the broken specimens is more similar to Duncan points in that it lacks shoulders, has a deeper basal concavity and has a relatively straight stem (see Quigg 1986; Figure 6.6:16).

Debitage is common in the Hanna occupations and is dominated by Swan River chert (53.6%), crystalline quartz (20.8%) and diatomaceous earth (11.4%). Exotic materials were not identified. Thirty-three cores were identified and are most commonly composed of Swan River chert, crystalline quartz and pebble chert (Quigg 1986:116-118).

Faunal specimens are numerous (13,245 specimens) but extremely fragmented (Quigg 1986:143). Most of the identifiable specimens are from large ungulates such as bison, moose, elk, and deer. A high degree of fragmentation is interpreted as evidence for the manufacture of bone grease but poor preservation due to high soil acidity may also be a contributing factor (Quigg 1986:151). In all cases it was impossible to identify

an accurate number of individuals, but it appears that the number is low (perhaps one animal of each species). Several fragmented foetal or newborn elements were also identified and, based on size, are likely from a moose or elk. Small mammals were also represented and include elements identified as hare, beaver and canid. Several fish elements and clamshell fragments are also present, although their use in the diet remains questionable.

Three features were identified and include a basin-shaped hearth, a concentration of fire-broken rock, and a burial. All of the features were located in the eastern excavation block but occurred in separate occupations and do not appear to be related. Many of the projectile points were concentrated around the hearth and appear to have been discarded during meat processing (Quigg 1986:124). A large number of bifaces, MURLs and flakes were also recovered in this area. The hearth is basin-shaped, roughly circular, and the fill contained a large amount of fire-broken rock, burned bone fragments and lithic debitage.

The concentration of fire-broken rock consisted of 38 pieces weighing 8.65 kg. Another 49 pieces were scattered around the main pile. The pile of debris is thought to have been produced by stone boiling. No other materials were associated with this feature (Quigg 1986:113).

A burial extended beneath the lowermost Hanna occupation. The skeleton was intact and found within a shallow grave. Grave goods were absent and there was no evidence for red ochre staining. Based on dental eruption and limb measurements, the skeletal age is estimated between 2.5 and 3 years of age. Sex of the individual could not accurately be assessed (Walker 1986:250).

The close association of the Hanna occupations prevents a detailed examination of artifact distribution. Still, localized clusters of artifacts indicate that the occupants were primarily concerned with processing large game, hide working, tool manufacture, and food preparation (Quigg 1986:160). Foetal/newborn elements from two of the occupations suggest a spring habitation.

Summary

Excavations at the Crown site revealed the presence of as many as seven McKean occupations. More significant is that fact that these occupations represent two separate components associated with McKean Lanceolate and Hanna projectile points. Crown is one of the northernmost McKean sites in Saskatchewan and the diverse faunal assemblage is a testament to the adaptability of McKean hunters. Furthermore,

the discovery of a human burial in the Hanna component provides important comparative data regarding McKean burial practices in the Northern Plains.

2.3.2 The Sullivan Site (EjNr-1)

The Sullivan site is located in south-central Saskatchewan approximately 5 km east of the South Saskatchewan River (Figure 2.13:6). This is an area of gently rolling prairie dominated by sandy deposits similar to the environmental setting of EgNo-23 located approximately 45 kilometers to the southeast. The site was discovered and initially investigated by a regional collector (Edgar Sullivan) in the 1950's. His limited excavations revealed at least 5 artifact localities that included both surface collections and buried components. The bulk of the assemblage was recovered in disturbed contexts and includes a large number of Duncan projectile points, knives, scrapers, choppers, and hafted bifacial tools (Johnson 1975).

Test excavations were conducted in 1964 by Gil Watson of the Saskatchewan Museum of Natural History (now the Royal Saskatchewan Museum). Watson noted the presence of at least two paleosols. The upper occupation was relatively thick (up to 20 centimeters) and was associated with a Duncan projectile point. The lower occupation was less developed but revealed a hearth and an Oxbow point (Ramsay 1993).

A total of 105 projectile points have been recovered from the site and approximately half of these are diagnostic. Johnson (1975) reports that the majority of these are of the Duncan type. Four Oxbow projectile points and at least one Pelican Lake point were also recovered. Nine side-notched bifaces were identified and Johnson (1975:10) suspects that the pattern of transverse breaks indicates that they were hafted to thrusting spears.

A large amount of bone was evident on the surface and was also encountered in the excavations conducted by Mr. Sullivan. Much of the bone appeared butchered and some remained articulated including, "a side of buffalo thrown on the pile..." (Johnson 1975:11). The test excavations also revealed bone in association with the upper paleosol including several articulated limb elements and a butchered longbone. Given the association of the projectile points with articulated bison elements it seems likely that the Sullivan site represents another McKean bison kill. Bone was not collected during these investigations and, as a result, the number of bison represented by the faunal elements is unknown.

2.3.3 The Lubyk Site (FhNh-138)

The Lubyk site is located along the top rim of the North Saskatchewan River valley near the city of Prince Albert in central Saskatchewan. The site has been disturbed and is represented by a large surface collection that covers a known area of approximately 25,000 square metres (Frey, 1997). Doug Frey has been the primary collector at the site since its discovery in 1994. During that time he has recovered over 300 artifacts, of which approximately 60 are diagnostic projectile points. Included in the collection are several Angostura points, two McKean Lanceolate points, and a Late Precontact period point. The remaining points have all been identified as Hanna (Frey, personal communication 2004).

Frey (1997) notes the presence of an extensive amount of debitage, as well as a number of cores and bifaces. Concentrations of fire broken rock, in combination with the large lithic sample, indicates that the site may have been used as a campsite in which activities included the primary reduction of rough nodules and the production and maintenance of stone tools (Frey 1997:59). Lithic materials are primarily local, but exotic materials such as Cathead chert and Tongue River silicified sediment are also represented. Interestingly, in his collections from sites surrounding Lubyk, Frey (personal communication 2004) notes the collection of a number of Hanna points constructed from Tongue River silicified sediment, providing further evidence for continued trade with the source region. Although disturbed, the Lubyk site is important in that it appears to represent activities related to the collection of local lithic materials and the production of stone tools. Unfortunately, the disturbed nature of the assemblage prevents a detailed analysis of localized activity areas.

2.3.4 The Big Kill Site (EbNj-2)

The Big Kill site may represent another McKean bison kill. The site is located along a sandy ridge just south of the city of Moose Jaw in southern Saskatchewan (Figure 2.13:16). Artifacts were strewn across the surface of the ridge and included lithic debitage and a large quantity of raw and burned bone (Wettlaufer 1951). Artifacts distributions seemed to indicate the presence of both kill and camp/processing areas. A small collection of artifacts from the Big Kill site is currently housed at the Royal Saskatchewan Museum. Included are seven projectile points, all typical of the McKean Lanceolate variety (illustrated in Dyck 1983:102). Several scrapers and retouched flakes are also present in the collection. Many of the tools are constructed from Knife River chalcedony, including several of the projectile points. Unfortunately,

bone was not collected and there is no indication that intact components are present at the site.

2.3.5 The Sjovold Site (EiNs-4)

The Sjovold site is a multi-component campsite located on the western bank of the South Saskatchewan River near the town of Outlook (Figure 2.13:7). A series of 21 cultural occupations were identified at the site (Dyck and Morlan 1995:98). The lowermost occupation (Layer XXI) is associated with a single Hanna style projectile point and a date of 3530±115 rcybp (S-2062; cal 4241 [3899] 3615) (Dyck and Morlan 1995:92).

A large amount of fire-broken rock was identified in the level and comprised the bulk of the lithic assemblage. Four stone tools were recovered and include a bifacial knife, a preform, a projectile point, and a hammerstone. Chipped stone debris is limited to 13 specimens, of which seven are Knife River chalcedony. The bifacial knife and projectile point are also constructed from this material (Dyck and Morlan 1995:530).

Most of the recovered faunal specimens were fragmented and may have been fractured to remove marrow (Dyck and Morlan 1995:534). Three bison, a deer or a pronghorn, and a meadow vole (non-cultural) were identified. Visual examination and metric attributes of some of the bison elements suggest a summer/early fall occupation.

Two features were uncovered in Layer XXI. Both of the features were partially exposed and are interpreted as shallow hearths or dump areas associated with hearth maintenance (Dyck and Morlan 1995:523-527). The lack of oxidized soil below these features may favour the latter interpretation.

Dyck and Morlan (1995:434) suggest that the recovered assemblage best represents a disposal area on the periphery of a larger campsite. Cultural acitivities include the processing of several bison limbs, as well as part of a deer or pronghorn. Large quantities of fire-broken rock may indicate the presence of roasting pits and/or stone boiling pits, although features of this type were not identified in Layer XXI.

2.3.6 The Billet Site (EkNv-36)

The Billet site is located near the town of Harris, Saskatchewan (Figure 2.13:8). The site is situated in an area of cultivated sand dunes similar to the Sullivan site and EgNo-23. Many of the artifacts were recovered on the surface including several varieties of Middle and Late Period projectile points, however, Hanna points dominate

the assemblage (see Dyck 1983; Figure 10.21:b-v). Limited testing revealed at least one intact occupation (Ramsay 1993). Five projectile points were recovered in the test units and four are identified as Hanna. The points were recovered in the vicinity of two hearths and samples from these features provided uncorrected dates of 3100±60 (S-2054; cal 3550 [3384] 3267) and 3465±115 rcybp (S-2053; cal 4077 [3696] 3466) (Dyck 1983:90). Several scrapers, a uniface, a core, and numerous pieces of debitage were also recovered from the test units (Ramsay 1993). Unfortunately, these units were quite small and provide little interpretive data. Furthermore, much of the site was disturbed by cultivation and the exact nature of the assemblage is difficult to assess.

2.3.7 The Graham Site (FaNq-30)

The Graham site was also discovered in a cultivated field, located to the immediate southwest of the city of Saskatoon (Figure 2.13:9). Surface collections were initially conducted by amateur archaeologists, leading to the recovery of a number of artifacts including a fragment from a human ulna (Walker 1984:140). Shortly after, Walker (1984) conducted a detailed assessment of the site, confirming the presence of a disturbed habitation. Subsurface testing also revealed the presence of an intact hearth feature and associated cultural remains.

The fill from the hearth contained a large number of burned and calcined bone fragments and many of these were identified as human. Cut marks were recorded on the margin of a rib, and even burning between the articular and non-articular surfaces suggests that the bones were not in articulation at the time they were placed in the hearth. Furthermore, an evaluation of fracture pattern indicates that the bone was burned in a dry state. Given this evidence, Walker (1984:142) suggests that the remains represent the cremation of a bundle burial.

One radiocarbon date of 3245±50 rcybp (S-1574; cal 3691 [3626, 3622, 3571] 3465) was obtained from a human bone (Walker 1984:142). Recovered artifacts include a single projectile point, a hafted biface, 10 bifacial performs, two antler tools, a bone tool, and numerous pieces of lithic debitage. All of the tools are constructed from local lithic materials, primarily chert. The point is identified as Duncan based on the presence of a basal concavity with rounded basal margins and a slight stem that terminates in gently rounded shoulders (Walker 1984:143). The hafted biface has a slightly convex base and broad side-notches. The bifacial preforms are quite large and are very similar to stage 3 and stage 4 preforms from the Lightning Spring site in South

Dakota (Keyser and Wettstaed 1995). The antler tools include a cut antler burr and an antler hammer. The lone bone tool is identified as a split rib awl (Walker 1984:142).

The Graham burial is enigmatic and somewhat atypical of McKean mortuary behaviour. Similar burials have yet to be identified for McKean and, as such, the overall significance is the unique nature of the site assemblage. Still, the burial is located within the main occupation layer and, in this sense, is similar to burials from other McKean sites.

2.3.8 The Mortlach Site (EcNl-1)

The Mortlach site is a multi-component campsite located in the Besant Valley in southern Saskatchewan (Figure 2.13:15). The site was first tested in 1952 and later excavated in 1954 and represents the first large-scale archaeological project in Saskatchewan (Wettlaufer 1955:12). A number of cultural "zones" were identified including an assemblage from the lowest level (zone 8) identified as the Thunder Creek culture (Wettlaufer 1955:58). Four projectile points were recovered and all are stemmed with an indented base. Wettlaufer (1955:71) noted distinct similarities with the Duncan and McKean points of the Angostura basin and, in fact, the points are now attributed to McKean. Only one of the points is complete (see Wettlaufer 1955:110-113) and is typical of the Hanna variety. The remaining specimens have broken basal margins and appear to have a Duncan or Hanna morphology. A small number of scrapers, preforms and choppers were also recorded and many are constructed from local quartzite cobbles.

No faunal materials are described, although one radiocarbon date of 3400±200 rcybp (S-2; cal 4348 [3808,3794,3720] 3271) was obtained from a bone sample (Wettlaufer 1955:58). Similarly, activity areas are not discussed although Wettlaufer (1955:78) indicates that the assemblage likely represents the remains of a temporary camp for a small group of hunters.

2.3.9 The Long Creek Site (DgMr-1)

Long Creek is another important multi-component site that was excavated in the 1950's. Together with the Mortlach and Oxbow Dam sites, data from these early investigations played a significant role in the initial evaluation of the culture history of Saskatchewan.

This site is located on the south side of Long Creek, a tributary of the Souris River, in extreme southeastern Saskatchewan (Figure 2.13:17). The site was excavated in 1957 in advance of the construction of the Boundary Dam Reservoir

(Wettlaufer and Mayer-Oakes 1960:1). Researchers identified nine cultural levels at the site, including a Hanna occupation in Level 5 (Wettlaufer and Mayer-Oakes 1960:17). A single Hanna projectile point was associated with three scrapers, a perforator, a chopper, several MURLs, and a small sample of lithic debitage and faunal remains (Wettlaufer and Mayer-Oakes 1960:48). Of interest was the recovery of a coyote canine that may have been used as a gaming piece. A series of 31 indentations in three rows are incised longitudinally along the tooth root. It appears that ochre has been rubbed into the indentations to make them stand out (Wettlaufer and Mayer-Oakes 1960:49).

Exact numbers of faunal specimens are not provided. Elements were identified from the following species: bison (*Bison bison*), dog (*Canis familiaris*), pocket gopher (*Thomomys talpoides*), cottontail rabbit (*Sylvilagus* sp.) and human (*Homo sapiens*) (Wettlaufer and Mayer-Oakes 1960:49). The human remains are limited to an upper pre-molar and do not appear to represent a burial. A sample of charcoal from Level 5 provided a date of 3363±115 rcybp (S-63a; cal 3890 [3630, 3617, 3610, 3598, 3589] 3359) (Wettlaufer and Mayer-Oakes 1960:50).

A re-analysis of the Long Creek site was completed in 2002. A re-examination of the stratigraphic profiles indicates that Level 5 includes at least two paleosols (5A and 5B) that may represent separate occupations (Bryant 2002:163). Based on artifact depth, it appears that the Hanna point is associated with level 5A. A bone sample was submitted to Brock University and provided a radiocarbon date of 3775±55 rcybp (BGS-2363; cal 4420 [4250] 4091). Given the degree of error associated with some of the earlier Saskatchewan radiocarbon dates, it is likely that this date provides a better representation of the period of occupation.

2.4 McKean Components From Alberta

While it is true that McKean projectile points have been recovered in many surface collections throughout southern and central Alberta, excavated components are relatively rare. Well documented multi-component McKean sites include Cactus Flower (Brumley 1975;1978) and Saahkómaapína (Head et.al. 2003). McKean assemblages have also been recovered from the Cranford site (Stuart 1990) and from Majorville Medicine Wheel (Calder 1977).

2.4.1 The Cactus Flower Site (EbOp-16)

Cactus Flower is located in the southeastern corner of Alberta (Figure 2.13:3). The site was discovered in a steeply eroding bank of the South Saskatchewan River in 1969 and was excavated between 1972 and 1974 (Brumley 1975:1). A total of 10 cultural occupations were identified, in many cases separated by thick floodplain deposits (Brumley 1975:11). Occupations I and II are located within the top meter of sediments and are attributed to the Pelican Lake Complex. The lowest occupation (Occupation X) was uncovered approximately 6 meters below the ground surface and lacked diagnostic artifacts. Intervening layers (Occupations III through IX) contained diagnostic McKean complex projectile points (Brumley 1978:176). Nine radiocarbon dates have been submitted from the McKean occupations and while many do not follow the stratigraphic order, most overlap at 2 standard deviations. Acceptable radiocarbon dates range from 3740±100 rcybp (S-1209; cal 4415 [4090] 3783) in Occupation III to 4220±130 rcybp (S-1210; cal 5213 [4828] 4418) in Occupation VIII (Morlan n.d.).

Occupations III through VI are clustered near the top of the stratigraphic profile. Associated projectile points are primarily Duncan and Hanna, although one McKean Lanceolate point was identified in Occupation IV. Approximately 1.5 meters of sterile sediments separate Occupation VI from Occupation VII, which also contains Duncan and Hanna point styles. The lower McKean occupations (VIII and IX) are located approximately 5.5 meters below the ground surface. Occupation VIII contained McKean Lanceolate, Duncan and Hanna point varieties, while a single McKean Lanceolate point was recovered in Occupation IX (Brumley 1975:123).

Similar artifact assemblages were recovered in each of the McKean levels. Common lithic tools include cores, bifaces, scrapers, MURLs, wedges, hammerstones, and choppers (Brumley 1975:124). Several bone tools were also identified including a number of pointed or polished specimens and numerous bone awls (Brumley 1975:126). A summary of the lithic and faunal assemblages is provided in Appendix C, Tables C.3 and C.4. Several of the recovered artifacts are relatively unique and require further description. In Level VI, the researchers recovered a small stone disc fragment, a shell disc fragment and a possible bone harpoon. The stone disc is is ground and polished with well-rounded edges (Brumley 1975:59). The shell disc is made from locally available freshwater clams (Brumley 1975:69). The function of these items is unknown. The harpoon-like item appears to have been made from a thick

longbone fragment. The entire surface is smooth and lightly polished with the exception of the proximal end, which is broken. A deep and well-formed notch is present on one edge and the distal end is rounded but blunt. Brumley (1975:66) notes that the item is shaped like a harpoon with the exception of the relatively flat distal end. It is possible that the item was not completely finished or was intended to perform a function that has yet to be ascertained. Level VIII revealed a fragment of a stone pipe. The item is well finished and is made from an indeterminate lithic material (Brumley 1975:60). Two shell beads were also recovered from the Cactus Flower site and have been made from exotic marine species. One of the beads is complete while the other is fragmented. Both of the specimens were identifiable (*Olivella biplicata* and *Natica clausa*) and are from species that are common along the western coast of North America (Brumley 1975:69).

Features were identified in all of the occupations including a number of surface hearths, basin-shaped hearths, earthen pits, and several ash concentrations (Brumley 1975:20-35). Basin-shaped hearths are more common in the lower occupations (Levels VII, VIII and IX) and are gradually replaced by surface hearths in the upper levels (Levels III, IV and V). Brumley (1975:35) notes that the basin-shaped hearths are associated with heavier concentrations of artifacts. This increase in debris may indicate that basin-shaped hearths are actually surface hearths that have been used over an extended period of time and become basin-like due to continual cleaning and re-use. Stone boiling features were not identified in the McKean assemblages although several of the earthen pits are deep enough to have held water in a bison hide container.

There is good evidence for the outline of a temporary living structure in occupation Level VIII (see Brumley 1975:139). The floor plan from this level clearly shows a circular debris pattern surrounding a central basin-shaped hearth. The pattern has an approximate diameter of 4.8 meters and the outer margins of the debris field are clearly delineated (Brumley 1975:19). Possible activity areas within the feature are not discussed but artifacts appear to cluster towards the edges of the structure.

Faunal remains were recovered from all levels at the Cactus Flower site. Bison remains clearly dominate the faunal assemblage, but elements from pronghorn and domestic dog are also present in significant numbers. Other animals represented include mule deer, kit fox, cottontail, jackrabbit, birds, clams, and fish; however, many of these are limited to a few identified specimens (Brumley 1978:181). At least 40

bison were identified, but with the exception of levels VIII and IX (20 and 6 respectively) few bison are represented in each level. Skull fragments and mandibles are common suggesting a relatively close proximity to the kill area. Longbone elements are fragmented along the shaft, indicating heavy processing to retrieve marrow and possibly bone grease (Brumley 1978:189-191). An examination of mandibular tooth eruption and immature long bones indicates that the majority of the occupations occurred in the fall. At least three of the levels (IV, VII, and VIII) also appear to have been occupied in the late spring or early summer. Evidence for winter occupation of the site was not recovered (Brumley 1978:181).

In terms of hunting strategy, Brumley (1978:192) suggests that the area represents one of the few points along the river system where large game can easily access water. The majority of the banks in this region are quite steep (some up to 90 meters in height), but a gently sloped beach area is present several hundred yards from the Cactus Flower locality. A hunting strategy based on the ambush of a small number of animals is likely in such a location.

2.4.2 Saahkómaapína (EeOv-68)

Saahkómaapína (the Boy Chief site) is also located in southeastern Alberta (Figure 2.13:4). The site is situated on an intermediate terrace located just above Little Sandhill Creek (Head et.al. 2003:16). Initial investigation of the site began in 1990 as a result of mitigation related to pipeline construction. A total of 97 square meters was excavated at this time and much of the effort was focused on three main excavation blocks. The largest of these (Block 3) contained evidence for at least six cultural occupations (Head et.al. 2003:19). Expansion of the pipeline led to further mitigation in 1994 and the excavation of another 166 square meters (Head et.al. 2003:198). Block 3 was expanded during this time to eventually encompass 142 square meters of excavation area. A fourth block was also excavated in 1994 (encompassing 24 square meters) in an area of low relief approximately 20 meters north of Block 3 (Head et.al. 2003:24).

There are distinct differences between the occupational histories of the two excavation blocks despite the close proximity of these areas. Block 3 revealed an older sequence of occupations including (from oldest to most recent): one Bitterroot, three Oxbow, one McKean Lanceolate, and one Pelican Lake (Head et.al. 2003:198). The Block 4 sequence includes a possible McKean Lanceolate or Hanna occupation followed by two Hanna and two Pelican Lake assemblages (Head et.al. 2003:199).

The most recent occupation in Block 4 lacked diagnostic artifacts but is believed to post-date 3000 B.P. based on the stratigraphic position of the recovered artifacts (Head et.al. 2003:159).

Block 3; Occupation 5

Occupation 5 is the only McKean component identified in Block 3. No radiocarbon dates were submitted but numerous diagnostic projectile points were recovered. Identified points include a likely Oxbow, three McKean Lanceolates, one Duncan, two Hanna, and one Pelican Lake. Four indeterminate point fragments were also recovered. Two of these appear similar to Pelican Lake while another resembles the base of a Hanna point (Head et.al. 2003:213-217). The presence of multiple point styles indicates that materials from several occupations have been included within this assemblage. Head et.al. (2003:22) note that in some areas artifacts from Occupations 5 and 6 are, "compressed into a single inseparable zone of material. Mixing of the Occupation 4 with materials from above is also quite possible." As a result the likelihood of delineating distinct activity patterns is dramatically decreased.

The remaining tool assemblage is quite large (n=200) and includes 80 cores and core fragments, nine bifaces, one uniface, 23 end scrapers, 13 side scrapers, five wedges, 67 MURLs, one drill, and one graver. Of particular interest is the presence of 59 bipolar cores (of which 32 are small chert pebbles) indicating a heavy reliance on bipolar reduction. The majority of the tools are constructed from local varieties of chert, although crystalline quartz and siltstone are also well represented. Lithic debitage is also dominated by chert, but includes significant amounts of quartzite, crystalline quartz, and siltstone (Head et.al. 2003:100).

Features include two lithic concentrations, three shallow basin-shaped hearths and a shallow surface hearth. One of the basin-shaped hearths (Feature 75) is associated with all three of the McKean Lanceolate points and provides the best evidence of an intact activity area (Head et.al. 2003:104). The general lack of cortex on the lithic debitage from Occupation 5 suggests that late stage lithic reduction is a primary activity. Fire broken rock is common in the assemblage and appears to be the product of stone boiling, although no stone boiling pits were identified. Faunal remains are heavily fragmented and poorly preserved. Nine bison elements were identified, representing a single animal aged between four and five years (Head et.al. 2003:97). Faunal evidence is limited, but available data indicate that the activities are related to end-stage processing (cooking meat and the removal of marrow).

Block 4; Occupation 1-4

Six occupations were observed in Block 4, although as many as 13 buried soil horizons were identified (see Head et.al. 2003, Figure 23). Occupation 1 is located at the bottom of the stratigraphic sequence and has a corrected date of 3650±80 B.P. (AECV-2023C; cal 4228 [3976,3941,3931] 3723). No diagnostic artifacts were recovered, however, based on rates of deposition Head et.al. (2003:185) believe that the occupation can be attributed to McKean. A uni-directional quartzite core represents the only tool from Occupation 1. Features are absent, but the fire broken rock is primarily water-fractured and hints at the presence of a stone boiling pit (Head et.al. 2003:128). Three bison were associated with Occupation 1 including a mature female, an immature individual and a late term fetus or neonate (Head et.al. 2003:124). The limited artifact assemblage provides little insight into the exact nature of this habitation; nevertheless, the presence of a small spring campsite may be inferred.

Radiocarbon samples were not submitted from Occupation 2. The presence of two Hanna projectile points and bracketing radiocarbon assays from Occupations 1 and 3 date the assemblage to approximately 3500 BP (Head et.al. 2003:135). Three cores, four MURLS, two bifaces, and an end scraper were also identified. Lithic materials are dominated by local varieties of chert and quartzite. A total of 26 bison elements, representing three individuals were identified (Head et.al. 2003:130). No features were associated with this occupation. The limited evidence suggests that secondary processing of bison limbs and both bipolar and bifacial reduction of lithic materials are the primary activities in Occupation 2.

Occupation 3 contains two Hanna projectile points and bone samples from this level provided corrected ages of 3360±80 BP (AECV-2024C; cal 3829 [3630,3618,3609,3599,3588] 3399) and 3400±90 BP (AECV-2053C; cal 3871 [3675,3673,3638] 3414) (Head et.al. 2003:141). The projectile points appear to be somewhat transitional between Hanna and Pelican Lake. They are triangular in shape and are widest at the shoulders. Corner-notching is present but the notches are relatively wide and u-shaped. Shoulders are sharp, more so than typical Hanna points, but they do not have a "tang" typical of some Pelican Lake points. Stems are expanding with rounded basal corners. One of the points exhibits a straight basal margin, while the other is slightly concave.

Two MURLs, one end scraper, and one bipolar core complete the recovered tool assemblage. Lithic debitage is dominated by quartzite and chert, and flake

patterns indicate both bipolar and bifacial reduction. The faunal assemblage includes 13 bison elements representing at least two individuals (Head et.al. 2003:137). A single hearth was discovered and was partially lined with seven pieces of fire broken rock. Faunal elements, lithic debitage and the remaining fire broken rock are distributed in a semi-circular pattern around the hearth and may outline the location of a temporary structure (Head et.al. 2003:141).

Occupation 4 contains two projectile points tentatively identified as Hanna that are associated with a corrected radiocarbon date of 3350±90 BP (AECV-2051C; cal 3831 [3628,3620,3606,3602,3584] 3381) (Head et.al. 2003:148). The Hanna designation appears to rely more heavily on the radiocarbon date than the projectile point style. The researchers note that, "the specimens would appear to be Pelican Lake, however, radiocarbon dates suggest a Hanna association." (Head et.al. 2003:147). I tend to agree that the projectile points are more typical of Pelican Lake. One of the points (see Head et.al. 2003: 147) has a definite tang on the right shoulder and the other point has a slightly convex base (unlike any Hanna point I have encountered). Both of the points have a long "Christmas tree" shaped profile that is also attributed to the Pelican Lake point. In my opinion, it appears more likely that Occupation 4 represents an early Pelican Lake component similar to Layer XX at the Sjovold site (Dyck and Morlan 1995). It should also be noted that Occupation 5 in Block 4 contained similar points (identified as Pelican Lake) in association with an early date of 3270±90 B.P. (AECV-2052C; cal 3693 [3471] 3272) (Head et.al. 2003:157).

Summary

Excavations at Saahkómaapína revealed at least four cultural occupations attributed to McKean. The cultural assemblage from Occupation 5 in Block 3 includes a mixture of projectile points, but the presence of a basin shaped hearth in association with three McKean Lanceolate points hints at the presence of at least one activity area that can be identified as McKean. Block 4 provides a much better sequence of occupations, and all appear to be representative of the Hanna variant. In general, the Block 4 occupations appear to represent small campsites. Activities include lithic reduction, meal preparation and possibly stone boiling, however, features of this type were not recorded during excavation. Artifacts from Occupation 3 of Block 4 are distributed in a semi-circular pattern around a stone-lined hearth. This pattern has been noted at several other sites (Cactus Flower, Redtail and EgNo-23) and may represent the location of a temporary structure such as a tipi.

2.4.3 The Cranford Site (DlPb-2)

The Cranford site is located on a high terrace above the Oldman River in south central Alberta (Figure 2.13:1). Researchers identified 35 stone circles and subsequent excavations revealed at least six buried archaeological components in possible association with these rings (Stuart 1990:3). Stuart (1990:30-31) suggests that five of the rings and one activity area can be attributed to people utilizing McKean projectile points. Only one of these rings (Ring 34g) was directly associated with McKean points. The other rings are associated either by depth or by the presence of silicified volcanic ash, a lithic material diagnostic of McKean assemblages at this site (Stuart 1990:31).

Having reviewed the information, the association of many of the points seems doubtful. Stuart (1990:32) notes that ring 34h is associated with a Hanna point, however, typologically it is much more similar to points from the Besant series (see Stuart 1990; Plate 10:5160). Rings 33d, 33g and 34d are included because of the presence of silicified ash, but are not associated with diagnostic points or radiocarbon dates. Ring 34g produced four McKean Lanceolate points and provides the best evidence for a McKean-aged structure. The internal and external diameters of the ring measure 4.88 and 5.95 meters respectively (Stuart 1990:41-44). Internal features include a cooking area, an area for refuse, a possible eating area, and a sleeping area (Stuart 1990:52-53).

Excavations below another ring (33h) led to the discovery of an intact McKean activity area. Recovered artifacts include four McKean Lanceolate points, a biface, scrapers, MURLs, choppers, hammerstones, and numerous flakes (Stuart 1990:85). Much of the lithic debitage has been identified as quartzite, indeterminate chert and crystalline quartz. Exotics include obsidian, silicified volcanic ash, Knife River chalcedony and Montana chert. Faunal remains were also numerous but heavily fragmented. Still, several elements from a bison were identified including a number of cranial fragments. The presence of numerous bison cranial and mandibular fragments may indicate a relatively close proximity to the kill area.

Activities in this level seem to cluster around a small surface hearth and include meal preparation, tool manufacture and possibly meat processing. A large quantity of fire broken rock was also recovered that may have been used for stone boiling, although no boiling pits were discovered. Stuart (1990:91) suggests that while it is

possible that stone boiling occurred, the concentration of rock may be related to cooking food rather than for the preparation of bone grease.

2.4.4 The Majorville Medicine Wheel (EdPc-1)

The Majorville Medicine Wheel is located on a high hill on the south bank of the Bow River in south central Alberta (Figure 2.13:2). The "wheel" includes a large central cairn surrounded by an oval-shaped circle of stone. A series of 28 spokes radiate from the cairn to the outer ring (Calder 1977).

The site was excavated in 1971 and included the removal of a ¼ section of the central cairn (Calder 1977:8). Excavation was conducted in "layers" by removing subsequent semi-circular deposits. A total of 16 of these layers were removed and artifacts were recovered in all of them, including 254 diagnostic projectile points (Calder 1977:30). Point varieties include Late Side Notched, Avonlea, Besant, Pelican Lake, Duncan, Hanna, McKean, and Oxbow. Many of the point styles were distributed throughout all of the layers, but a seriation of the types appears to indicate a general change in style through time. Calder (1977:30-37) uses these data to outline seven discrete periods of cairn construction representing a long continuity of similar belief systems.

A quick examination of the projectile point frequencies (see Calder 1977:230; Figure 12) does not necessarily support this interpretation. It is important to note that Avonlea, Besant, Duncan/Hanna, and McKean/Oxbow projectile points have a nearly identical distribution throughout the cairn. Calder (1977:29) noted extensive rodent burrows and the remains of as many as 50 Richardson's Ground Squirrels during the excavation. While it is clear that McKean projectile points are present at the site, it also appears that much of the original context has been lost and calls into question the interpretive value of the data.

2.5 McKean Components in Manitoba

There are few well-stratified multi-component McKean sites reported from the Province of Manitoba. Single components have been recorded at a number of sites, but assemblages tend to be small or have been subjected to stratigraphic mixing. Still, McKean points are common in surface collections and are generally distributed throughout the southern portion of the Province (Syms 1969). Sites are often located along waterways and there appears to be a deliberate selection for areas with a mosaic of wetlands and prairie (Boyd 2000). Sites included here are of interest since

they contain some of the best evidence for intact components. Perhaps most significant is the fact that each is located in the boreal forest, providing insight into the adaptability of McKean.

2.5.1 The Pas Reserve Site (FkMh-5)

The Pas Reserve Site is located on the bank of the Saskatchewan River in northwestern Manitoba (Figure 2.13:18). The site was excavated by Morgan Tamplin between 1968 and 1972 and revealed a sequence of occupations ranging from "Archaic" near the bottom of the excavation to Selkirk phase materials in the upper components (Tamplin 1973). Projectile points from the "Archaic" component include both Duncan and Hanna types (Tamplin 1977:145-146). Several end scrapers and side scrapers were also associated with the points. Artifacts from this level were associated with two small charcoal-filled pits. A sample of the charcoal provided a radiocarbon date of 3190±60 rcybp (A-1369; cal 3553 [3435,3433,3393] 3268). Researchers recovered a relatively large number of bison elements in this occupation, although fish (burbot) and canids were also used as a food source.

2.5.2 The Tailrace Bay Site (GRS-3)

The Tailrace Bay Site is located on the shore of the Saskatchewan River near the foot of the Grand Rapids on the Saskatchewan River (Figure 2.13:19). The site was excavated in 1961-1962 by Mayer-Oakes and these investigations revealed at least three periods of occupation. The site had poorly defined stratigraphy and had been previously disturbed by cultivation, but natural "zones" were identified and included "sod", "plow", "gray" and "gravel" (Mayer-Oakes 1970). The "gravel" zone contained eight complete and fragmented projectile points and five basal fragments. All of the points are considered McKean Lanceolate with the exception of one slightly shouldered specimen that may represent a Duncan point (Syms 1969).

A large faunal assemblage with over 22,600 bones and bone fragments was recovered from the site (Lukens, Jr. 1967:315). Of the identified specimens, approximately 44% are from fish (7 species), 44% from mammals (18 species) and 12% from birds (34 species). Small quantities of bison remains were recovered and may represent the movement of people from a southern hunting area. Faunal artifacts are not separated by level, but a significant number of elements from sturgeon (*Acipenser fulvescens*) and northern pike (*Esox lucius*) were recovered in the gravel zone (Syms 1969). The location of the site, in close proximity to a series of rapids, may also indicate that fishing was an important subsistence activity.

2.5.3 The Cemetery Point Site (EaKv-1)

This is a multi-component site located on the shore of Nutimik Lake near the mouth of the Whiteshell River in southeastern Manitoba (Figure 2.13:20). The site was excavated in 1953 and the projectile points from several of the lower occupation zones (Zone C) were used by MacNeish (1958) to define the Whiteshell Focus. It was later determined that the materials from several zones were mixed and, as a result, Syms (1969) conducted a re-analysis of Zone C (Levels 4,5, and 6). His study revealed that considerable mixing had occurred, although Level 6 may represent a relatively pure McKean occupation in association with a McKean Lanceolate and a Duncan point. The faunal assemblage is highly fragmented and Level 6 contained only two specimens, a molar from a beaver (*Castor canadensis*) and a multi-barbed antler harpoon. The presence of the harpoon and the location of the site (near two sets of rapids) suggests that fishing was an important activity, although fish remains were not identified in the level 6 assemblage.

2.6 Summary

Since 1969 a significant number of McKean components have been excavated in the Canadian Plains. Many of these contain impressive multi-component assemblages that have yet to be reported in the scientific literature (such as Thundercloud and Redtail). Others have only recently been published (Saahkómaapína) or represent newly excavated sites (EgNo-23, Meewasin, Cut Arm). Of the remaining sites, most have received little attention even though many contain artifact assemblages that may contribute significantly to our knowledge of McKean as an archaeological entity. What follows then, is a summary of the data from many of these sites, in an attempt to update the McKean record in the Northwestern Plains region. When applicable, these data will be compared to previous McKean research from throughout the Northern Plains as it applies to settlement and subsistence patterns, origin hypotheses, and McKean taxonomy. It is hoped that by doing so, a much clearer picture of McKean will emerge.

Chapter 3

Subsistence and Settlement Patterns

3.1 McKean Subsistence

3.1.1 Overview

A serious analysis of McKean would not be complete without a discussion of patterns in McKean subsistence. Interpretations of these patterns vary and like many of the debates regarding McKean they were sparked by reports of the artifact assemblages from many of the initial McKean investigations. For instance, Mulloy (1954:453) describes a sparse faunal assemblage from the McKean type-site noting that, "...the bones of animal[s] of rabbit size and smaller were much more common than those of larger animals...". Taxa in the lower level (associated with McKean projectile points) include bison, pronghorn, deer, canid, rabbit, rodent, and frog. Also noted in the lower level were several slab-lined hearths, interpreted as possible roasting pits, and fragments from a small sample of manos and metates. Wheeler (1995, 1996, 1997) noted similar associations during his survey of three reservoir areas in South Dakota and Wyoming. He identified a large number of McKean components and, at sites such as Harney (Wheeler 1995) and Mule Creek Rockshelter (Wheeler 1996), McKean projectile points were found in association with grinding stones and slab-lined hearths. The presence of these artifacts and features led to the suggestion that the people of the newly defined McKean Complex were utilizing a broad-based subsistence strategy that relied on a variety of locally available resources (Mulloy 1954; Wheeler 1996). Moreover, the presence of grinding stones seemed to indicate an increased reliance on, "...gathering and processing wild plant foods" (Wheeler 1996:121).

Later excavations at sites such as Leigh Cave in north-central Wyoming supported this interpretation (Frison and Huseas 1968). Researchers at the site recovered a well-preserved sample of perishable remains including several fragments of plant fiber cordage, sinew and hide. Several plant species appear to have been

utilized as a food resource as evidenced by the presence of numerous wild onion bulbs, chokecherry pits, pads from prickly pear cactus, and several varieties of seeds. Given the excellent state of preservation, faunal elements were relatively rare with the exception of several hundred Mormon crickets that appear to have been roasted in a hearth. Manos and metates were also recovered from the occupation providing further evidence of the importance of plant processing to the Leigh Cave occupants.

Since these early excavations, grinding stones have been recorded in association with McKean projectile points at as many as 12 sites in the southern portion of the Northwestern Plains. Included are components from Bottleneck Cave, Mummy Cave, Dead Indian Creek, Leigh Cave, McKean, and Mule Creek Rockshelter in Wyoming; Dipper Gap in Colorado; Lightning Spring, Gant, George Hey, and Harney in South Dakota; and Signal Butte in Nebraska (Husted 1991; Husted and Edgar 2002; Frison and Walker 1984; Frison and Huseas 1968; Mulloy 1954; Wheeler 1996; Metcalf 1974; Keyser and Davis 1984; Gant and Hurt, Jr. 1965; Tratebas 1998; Wheeler 1995; Strong 1935). Slab-lined roasting pits are also common in many of these components and they may have been used to roast seeds prior to grinding. Such evidence has led some researchers (see Keyser 1986) to suggest that plant procurement and processing is an important aspect of the McKean subsistence strategy. An overall problem with this hypothesis is the general lack of recovered plant remains from the McKean components at these sites. In fact, preserved floral materials have been recovered at only four of the twelve sites mentioned above (Table 3.1). Tratebas (1998:288) reports that several seeds have also been recorded at Red Canyon Rockshelter in extreme northeastern Wyoming, but grinding stones do not appear to have been identified at the site. A quick survey of the data shows that at a majority of the sites, the samples are too small to indicate a heavy reliance on plants by the site occupants. Also, at sites such as George Hey grinding stones are pecked and pitted rather than polished and ground. Pitting is more likely to occur from pounding, as would occur during the production of pemmican (Tratebas 1985). Furthermore, some of the slab-lined hearths are as much as 2 meters in diameter and seem overly large to have functioned as seed roasting pits. These observations have led other researchers (Haberman 1986; Tratebas 1998) to suggest that processing of meat or larger plant resources (such as roots and tubers) may be a better explanation for the presence of grinding stones in some assemblages.

Table 3.1. McKean Sites Associated with Preserved Plant Remains.

Site	Associated Plant Remains	Reference
Lightning Spring	33 carbonized seeds, 26 fragments including *Chenopodium, Rumex/Polygonum*, Compositae, Fabaceae, and Gramineae.	Keyser 1986
McKean	14 seeds, 9 areoles including *Chenopdium* (2), *Amalanchier alnifolia* (1), *Pinus ponderosa* (10), *Opuntia polyacantha* (9 areoles), and Cruciferae (1).	Latady and Dueholm 1985
George Hey	5 seeds including *Atriplex* (4) and Gramineae (1)	Tratebas 1998
Leigh Cave	Hundreds of bulb coverings from *Allium;* large quantities of pits from *Prunus demissa;* lesser numbers of seeds from *Pinus flexilis, Rosa woodsii*, and *Shepherdia argentia.*	Frison and Huseas 1968
Red Canyon Rockshelter	6 seeds, all identifed as *Chenopodium.*	Tratebas 1998

It is also important to stress that, while grinding stones have been recovered from a number of McKean components, not all of the sites in the southern portion of the Northwestern Plains contain assemblages that are indicative of an archaic adaptation. For instance, the McKean components at sites such as Carbella, Dead Indian Creek, Lissolo Cave, Belle Rockshelter, and Lightning Spring reveal evidence of small-scale hunting activities that are clearly focused on one or more species of medium to large artiodactyls (Arthur 1966; Frison and Walker 1984; Steege and Paulley 1964; Wheeler 1996; Keyser and Wettstaed 1995). Moreover, the Scoggin site (Lobdell 1973) in southern Wyoming provides evidence of a large-scale cooperative bison kill that included the use of a well-built corral (Frison 1991). The use of cooperative hunting may also be implied by the assemblage recovered from the Cordero site in northeastern Wyoming (Reher et.al 1985). Excavations at Cordero revealed a relatively large sample of processed bison bone that represents "...the activities of specialized big game hunters and not those of generalized foragers...(Reher et.al 1985:120).

Interpretations of McKean subsistence strategies in the Canadian Plains are often limited to a discussion of the faunal assemblage from the Cactus Flower site in southeastern Alberta (Brumley 1978; Keyser 1986; Tratebas 1998). This is by no means the fault of the researchers, given the fact that much of the information with regards to McKean subsistence in the Canadian Plains has yet to be published. In fact, as I have stressed else where in this volume the only large-scale McKean

research projects that had been published prior to the turn of the millennium were by Brumley (1975: Cactus Flower), Quigg (1986: Crown), and Syms (1969: Manitoba McKean). Given the fact that faunal remains were poorly preserved at most McKean sites in Manitoba, and that Quigg had yet to publish the Crown site monograph, there was little else to rely on other than Brumley's (1975; 1978) assessment of the Cactus Flower faunal assemblage. Bison is clearly the most utilized species in the McKean occupations at Cactus Flower and this, combined with a complete lack of grinding stones in the Canadian Plains, led to the suggestion that, "As these McKean groups spread further north into the prairies of what is now Canada, they apparently altered their Archaic subsistence base...which, in this case, meant a virtually total reliance on bison (Brumley 1975:102)." As a result of the large amount of new data presented in Chapter 2, McKean subsistence in the Canadian Plains can now be re-examined on a much larger scale.

3.1.2 Recovery Methods

It is important to remember that at the time when the first McKean sites were being excavated many of the techniques that are now used to recover small-scale plant remains were not in practice. The methods of artifact recovery used in these investigations remains a key factor in the debate over the function of grinding stones in McKean assemblages. Keyser (1986:231) has suggested that:

> ...one major research emphasis in future excavations of McKean complex sites should be flotation recovery. Only in this way can we begin to accumulate data that will adequately describe the McKean economy and permit testing of hypotheses such as those advanced concerning mano/milling slab function, McKean culture groups, and the importance of plant foraging to McKean subsistence.

This statement is obviously directed at issues regarding McKean plant use, but could easily be expanded to refer to McKean subsistence strategies as a whole. Fine-screen recovery techniques (including dry screening, water screening, and flotation) dramatically increase the recovery of small-scale archaeological micro-remains (Gordon 1993; James 1997). As a result interpretations of subsistence based on coarse-screened samples (using ¼ inch mesh) are much less reliable than those from sites where fine-screening techniques are employed. This is especially relevant to McKean considering that broad-based foraging is thought to be an important aspect of the subsistence strategy in many areas. For instance, the recovery of a diverse faunal assemblage in the McKean levels at the Thundercloud site (Webster 1999:139) does

not support Brumley's (1978) hypothesis that northern McKean populations had adopted a strategy that relied entirely on bison. In an effort to test the importance of fine-screening recovery methods Webster (1999:212) compared the faunal assemblages, and the methods used to obtain these samples, from four multi-component McKean sites in Alberta and Saskatchewan.

The sites were chosen for the following reasons: they are generally well documented; they contain quite large and well-preserved faunal assemblages; they contain multiple McKean occupations that, for the most part, were inhabited during the warmer seasons of the year; they have all revealed occupations that are identified as short-term campsites; and all of the sites are found in ecotonal regions along the Saskatchewan River system with easy access to a wide variety of floral and faunal species. A primary difference between these sites is the screening method used to recover the identified faunal assemblages. At the Cactus Flower site much of the sediment was screened using ¼ inch mesh (Brumley 1975:7). There is no mention of flotation for hearth samples, although in some areas the researchers recorded thin layers of fine ash near several of the hearth features that was dry-screened through a $^{1}/_{16}$ inch mesh (Brumley 1975:10). At present the fine-screen samples that were obtained from these ash areas have yet to be analyzed (Walker, personal communication 2003). A ¼ inch mesh was also used to screen all of the excavated sediment from the Crown site (Quigg 1986:9). Hearth samples do not appear to have been treated differently and there is no mention of a fine-screening program in the site documents.

Sediments excavated from the Thundercloud and Redtail sites were screened in a much different manner. Ramsay (1993:50-52) reports that several techniques were used at Redtail. The primary screening technique consisted of passing sediment through a ¼ inch power screen. An intensive fine-screening program was also employed that involved water-screening some of the sediments through a $^{1}/_{16}$ inch mesh. During the first field season sediment from the northeastern quadrant of each excavation unit was processed in this manner. The program was expanded in the second year of excavation to include half of all excavated sediments from Layers 8 through 14 (Ramsay 1993:51). A detailed analysis of the fine-screen samples has only recently begun, but is sure to provide a clearer picture of the cultural activities in these occupations. Lastly, the sediment recovered from a number of hearth features at the Redtail site was bagged and saved for later examination. Seven of these samples

were submitted for flotation analysis leading to the recovery of a large number of bone fragments, charcoal, and seeds (Ramsay 1993:232-238).

Similar techniques were utilized at the Thundercloud site (Webster 1999:34). Sediment from the northwestern quadrant of each excavation unit was water-screened through a $^{1}/_{16}$ inch mesh and the remaining material was coarse-screened using a ¼ inch mesh. Feature samples were bagged and later hand-floated using a manual flotation bucket. All of the coarse-screened, fine-screened and flotation samples from the Thundercloud site have been processed and analyzed. The results of that study are included in the faunal and floral analyses of the Thundercloud site assemblages (Webster 1999).

A comparison of the four faunal assemblages is provided in Table 3.2. The identified taxa from each site are arranged by size class using a system that is based on an average body weight for each species. In general animals in size class 6 are very large, animals in size classes 3 to 5 range from medium to large, and animals in size classes 1 and 2 range from very small to small. Note that there is a relatively similar distribution of species from size classes 3 or larger at each of the sites. Remains of bison, deer, canids, and leporids clearly dominate the assemblages, although the increased reliance on moose and elk at the Crown site also reflects the proximity of the site to the boreal forest. There is a dramatic difference in the assemblages for species that are from size class 2 or smaller. Small animals and plant remains are virtually non-existent at the Cactus Flower site, and at the Crown site the recovery of a relatively large number of fish and mollusk remains is due to the presence of several discrete artifact concentrations that were readily observable during excavation.

Not all of the specimens recovered from the Redtail and Thundercloud sites are considered to be present as a result of cultural activities, but there is good evidence from both of the sites to suggest that a number of the smaller animals (including many of the rodents and several frogs) were being utilized as a food resource (Webster 1999:201). Moreover, in many of the occupations the minimum number of bison is low (1 or 2 individuals) and the diet is clearly supplemented by a variety of medium and large mammal species. In light of this new evidence it seems that, in some cases, the perceived difference between northern and southern McKean populations is the result of sampling error rather than a true cultural adaptation.

Table 3.2. A Comparison of the Faunal and Floral Assemblages from McKean Components at the Redtail, Thundercloud, Crown, and Cactus Flower Sites by MNE and MNI (in parentheses).

Scientific Name	Redtail*	Thundercloud	Crown	Cactus Flower	Size Class**
Bison bison	715 (12)	303 (8)	203* (6?)	883 (37)	
Alces alces			19 (5)		
Cervus elaphus			61* (5?)		6
Ursus sp.			1 (1)		
Antilocapra americana		1 (1)		56 (6)	
Odocoileus sp.	16 (1)		1 (1)	3 (1)	
Canis sp	44 (8)	47 (2)			4 & 5
Canis familiaris			156* (5)	25? (5)	
Taxidea taxus		7 (1)			
Lynx sp.		1 (1)			
Vulpes vulpes	1 (1)			1 (1)	
Vulpes sp.		1 (1)			
Mephitis mephitis	1 (1)	2 (1)	2 (1)		
Lepus townsendii	5 (2)				
Lepus americanus	1 (1)				
Lepus sp.		4 (1)	33* (4)	1 (1)	
Sylvilagus nuttalii		20 (2)		2 (2)	3
Castor canadensis			75* (5)		
Corvus brachyrhynchos	2 (1)				
Anas platyrhynchos	2 (1)				
Anas cf. *crecca*		1 (1)			
Phasianidae		1 (1)	1 (1)		
Raptor - small				1 (1)	
Quiscalus quiscula?				1 (1)	
Mustela vison	1 (1)				
Spermophilus richardsonii	? (3)				
Spermophilus tridecemlineatus	? (1)				
Spermophilus sp.		9 (2)			
Thomomys talpoides	? (1)	1 (1)			2
Eutamius minimus	? (4)				
Catostomas sp.			7 (1)		
Osteichthyes indet.	3 (1)		58* (2?)	1 (1)	
Cleithrionomys gapperi	? (2)	2 (2)			
Lagurus curtatus		1 (1)			
Microtus ochrogastor	? (1)				
Microtus pennsylvanicus		9 (3)			
Microtus sp.	? (1)	3 (?)			
Peromyscus maniculatus	? (3)	23 (1)			
Reithrodontomys megalotis	? (1)				
Cricetidae Indeterminate	? (1)	36 (4)			1
Microsorex hoyi		1 (1)			
Passerine	7 (1)	3 (2)		1 (1)	
Unionidae	3 (1)	1 (1)	56* (?)	4 (4)	
Bufo sp.		1 (1)			
Anura indet.	8 (3)	19 (2)			
Seeds - fragments (complete)	191 (38)	0 (2)			

* denotes NISP instead of MNE; note that NISP is used for the entire Redtail Fauna

** modified from Dyck and Morlan (1995:140)

3.1.3 McKean Subsistence Strategies

People who produced McKean projectile points are generally described as being highly adaptable, having developed strategies to exploit resources in a variety of settings such as the Boreal Forest of Manitoba and the mountain ranges of Wyoming and Colorado (Dyck and Morlan 2001). Too much emphasis has been placed on the division of McKean from north to south, and not enough on examining overall site function and adaptations to locally available resources.

In terms of site function the activities associated with the occupations play a large role in shaping the faunal assemblage and the amount of diversity that is present within the sample. Generally, bison kills and processing areas are not occupied for an extended period of time and should therefore have a lower diversity of utilized species. Long-term campsites, or sites used as base camps throughout the seasonal round, may be utilized for an extended period of time and should reveal the highest faunal and/or floral diversity. In the case of the Cactus Flower site several of the occupations are identified as short-term campsites, but levels are also associated with secondary processing of bison in close proximity to the kill area. Brumley (1978) may have correctly assessed the nature of the site, in that it represents a group of people who relied heavily on bison for their subsistence; however, suggesting that such an activity represents the norm for the entire local population is open to obvious criticism. Hofman (1997:xvii) notes that, "If we interpret McKean subsistence and technology on the basis of a single site or small regions, we will very likely miss significant elements of and variability within the system." As such, the Redtail and Crown sites provide a much better example for interpreting another aspect of the McKean subsistence strategy in the Canadian Plains. At both of the sites the majority of the occupations are considered to be short-term campsites and they also revealed occupation levels with higher densities of artifacts that may indicate the use of longer-term base camps. In such cases evidence for a broad-based subsistence strategy is more likely to be recovered.

Unfortunately many of the fine-screened samples from the Redtail site have yet to be examined. Still, the diversity of faunal and floral remains recovered from several hearth samples is impressive and provides a glimpse at cultural adaptations that, until now, have been considered characteristic of southern McKean populations. The significance of the seed sample from the Redtail site cannot be understated. With the exception of Leigh Cave, Redtail has the largest seed assemblage of any McKean site

in the Northern Plains and at present only seven of the fifty hearth samples that were collected during excavation have been processed. Most of the seeds recovered from the Redtail site are considered to represent potential food items. More importantly this is the first site in the Canadian Plains that has definitive evidence of McKean plant utilization. The recovery of what appears to be two grinding stones, one in direct association with the largest concentration of seeds, may also support Keyser's (1986) assumption that McKean grinding stones were used to process plant foods.

The discovery of a pithouse in level 8 of the Redtail site also hints at direct connection to archaic adapted cultures (Figure 3.1). Unfortunately cultural diagnostics were not recovered from Level 8 and radiocarbon dates were not obtained. Ramsay (1993:79) believes that Layers 3 to 7 are associated with the latter part of the Middle Precontact Period (Middle Archaic) and it is therefore possible that level 8 represents a late stage McKean habitation. Luckily half of this feature remains intact and the potential to recover culturally diagnostic artifacts still exists.

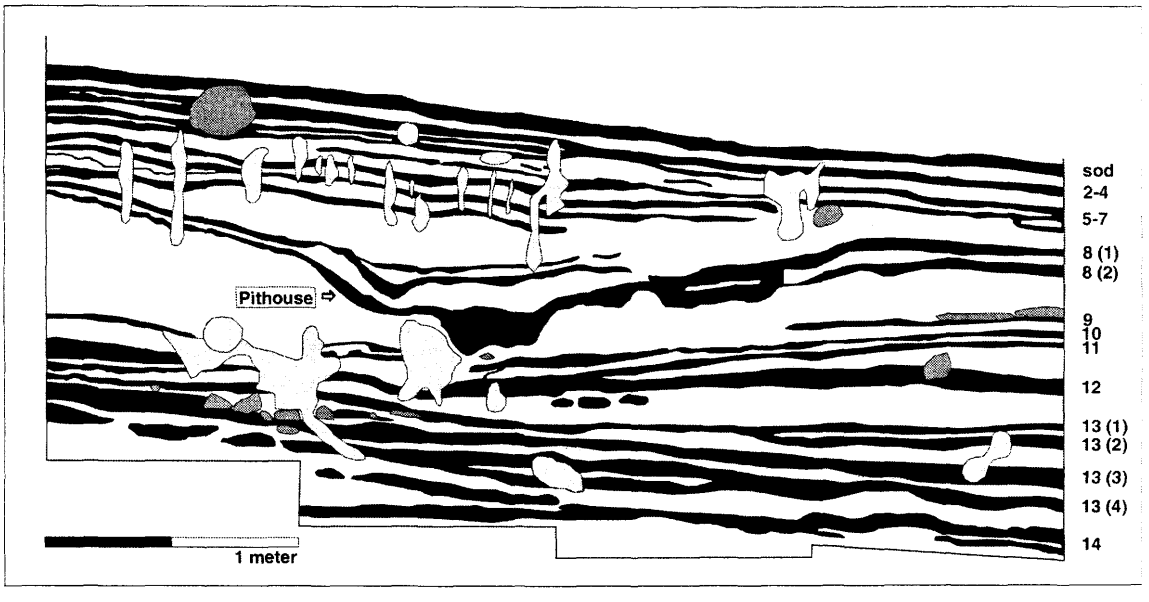

Figure 3.1. Stratigraphic Section from the Redtail Site Including the Profile of a Pithouse in Layer 8 (From Ramsay 1993:77).

The Thundercloud site faunal assemblage also revealed evidence of a more diverse subsistence base. The McKean component includes the remains of at least 16 species of mammals, four species of birds, and two amphibians. Fine-screen samples taken from hearth features revealed a number of burned and calcined specimens from several small mammals, a microtine rodent, and a small bird (Webster 1999:201).

Two burned seeds (*Prunus virginiana* and *Rosa*) were also identified in the McKean occupation (Webster 1999:159).

The faunal assemblage from the Crown site is generally overlooked in the current literature. Like Redtail the primary source of meat for the Crown site inhabitants is from large artiodactyls. Unlike Redtail the more northerly location of the Crown site allows for access to a greater variety of large mammal species and it appears that bison, moose and elk are of equal importance to the occupants of the site. Numbers of animals are low, however, and are generally limited to one or two individuals per occupation. The remaining faunal assemblage indicates that the diet was supplemented by a number of small and medium-sized mammals that includes dogs, hares and beaver. Quigg (1986:87; 147) also notes the recovery of a relatively large sample of elements from both clams and fish. Many of these specimens were associated with features and some of the fish elements are burned.

Fish remains are also associated with McKean occupations at several sites in Manitoba. At the Pas Reserve Site (Tamplin 1977) Duncan and Hanna projectile points were associated with the remains of burbot (*Lota lota*), canids, and bison. The Tailrace Bay site (Lukens, Jr. 1967) also revealed a diverse faunal assemblage. Faunal remains recovered from the gravel zone (associated with McKean Lanceolate points) include elements from bison, sturgeon (*Acipenser fulvescens*) and northern pike (*Esox luscious*) (Syms 1969). Interestingly both the Pas Reserve and Tailrace Bay sites contained bison remains even though the animals are not believed to have been common in the area. This evidence may indicate seasonal utilization of local resources by groups that had moved into the area from southern hunting zones.

It should be clear from the evidence presented that McKean hunters did not rely solely on bison as a food resource. Even so, this discussion is not meant to decrease the importance of bison as a resource in the Canadian Plains. For the most part McKean components that exhibit a broader spectrum of animal species are located outside, or on the fringes of, the grassland environment and include sites in the Boreal Forest, Aspen Parkland, and in tributary valleys of major river systems (Figure 3.2). A similar pattern is present in the southern portion of the McKean range, in that the sites with the highest diversity are often located in the foothills or mountains. Sites in these areas show a heavier reliance on deer, pronghorn, mountain sheep, hares, rabbits, and occasionally small mammals. Manos and metates are also more prevalent at these sites and are less common at McKean sites in the open Plains.

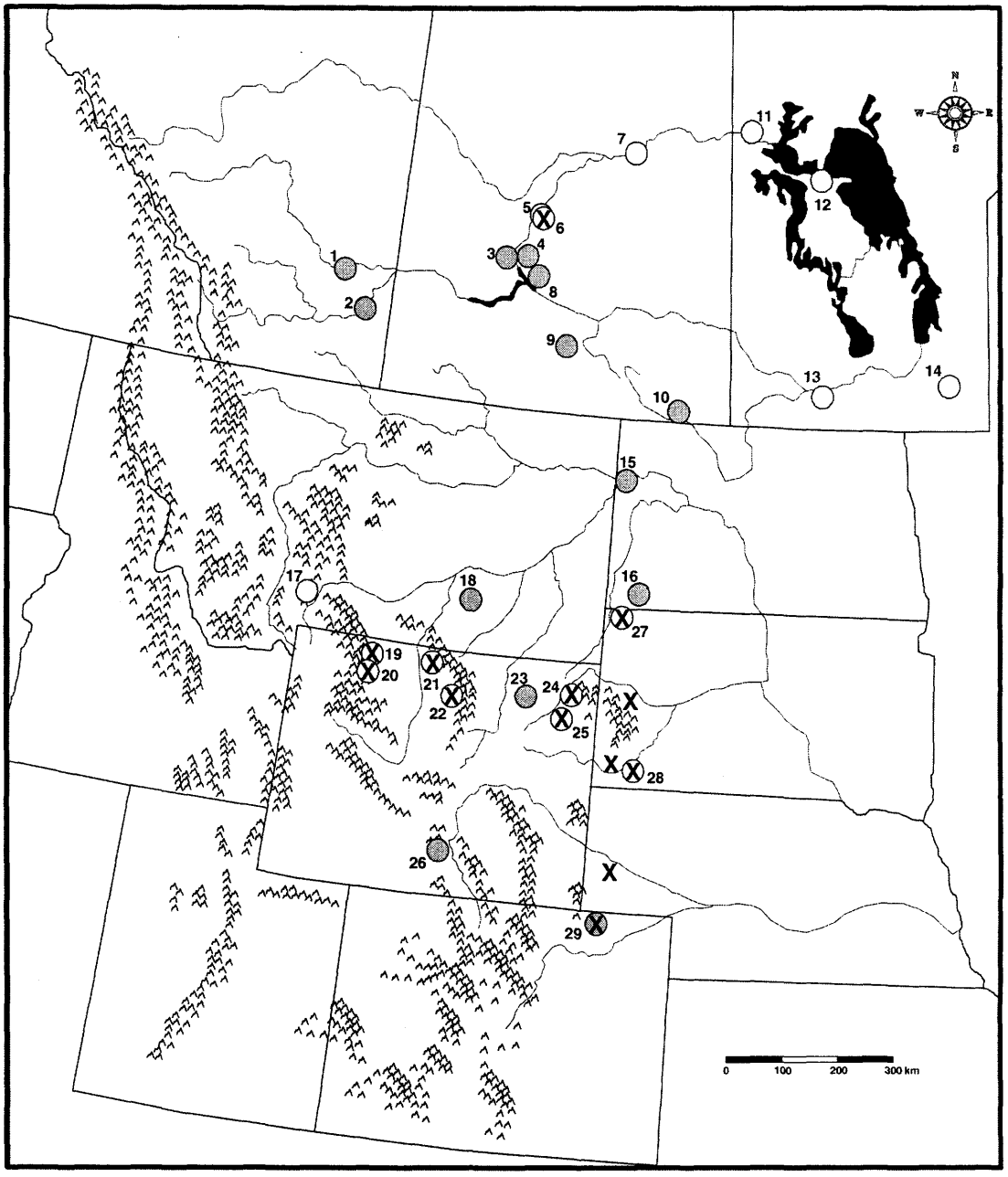

Figure 3.2. Plot of McKean Components with Faunal Assemblages that are Primarily composed of Bison (Gray) and Assemblages that Exhibit a Greater Diversity of Species or do not Indicate Bison as the Primary Resource (White). Sites Marked with an 'X' are also Associated with Grinding Stones:
1. Saahkómaapina (Head et.al. 2003); 2. Cactus Flower (Brumley 1975); 3. Sjovold (Dyck and Morlan 1995); 4. Sullivan (Johnson 1975); 5. Thundercloud (Webster 1999); 6. Redtail (Ramsay 1993); 7. Crown (Quigg 1986); 8. EgNo-23; 9. Big Kill (Dyck 1983); 10. Long Creek (Wettlaufer and Mayer-Oakes 1960); 11. Pas Reserve (Tamplin 1977); 12. Tailrace Bay (Lukens 1967); 13. United Church (Syms 1969); 14. Cemetery Point (Syms 1969); 15. Mondrian Tree (Toom 1983); 16. Red Fox (Syms 1969); 17. Myers-Hindman (Lahren 1976); 18. 24RB1164 (Munson 1992); 19. Dead Indian Creek (Frison and Walker 1984); 20. Mummy Cave (Husted and Edgar 2002); 21. Bottleneck Cave (Husted 1991); 22. Leigh Cave (Frison and Huseus 1968); 23. Cordero Mine (Reher et.al. 1985); 24. McKean (Mulloy 1954); 25. Mule Creek Rockshelter (Wheeler 1996); 26. Scoggin (Lobdell 1974); 27. Lightning Spring (Davis and Keyser 1999); 28. George Hey (Tratebas 1998); 29. Dipper Gap (Metcalf 1974).

Bison dominated assemblages, on the other hand, are more typical in the open grasslands and foothills of the Northern Plains. Given the fact that McKean populations seem to readily adapt to many environmental areas it should come as no surprise that bison form a large portion of the resource base for groups living in an open grassland setting. Bison and pronghorn were extremely numerous throughout much of the McKean range and it is counter-productive to assume that Middle Period populations would ignore such a readily available food resource, regardless of whether or not they were adapted to a more "archaic" subsistence base.

At the same time it is also limiting to suggest that an increased reliance on bison is limited to the Canadian Plains. It is clear from sites such as Cactus Flower, Sullivan, Big Kill, EgNo-23, Scoggin, and Cordero that McKean hunters were quite capable of killing relatively large numbers of bison (Brumley 1975; Johnson 1975; Dyck 1983; Webster this volume; Lobdell 1974; Reher et.al. 1985). At present, the largest bison assemblages have been recovered from the Cordero and Scoggin sites in Wyoming, and the Scoggin site has revealed the only evidence for a large-scale cooperative hunt using some form of man-made enclosure. The assemblages from the Sullivan and Big Kill sites may also represent large kill events, but unfortunately both of these sites were disturbed by cultivation and faunal materials were not collected for analysis.

The smaller assemblages from Cactus Flower, EgNo-23, and Cordero also indicate the use of cooperative hunting, although perhaps on a smaller scale. Occupations at the Cactus Flower site are located several hundred meters from a low beach area that would have provided easy access to the river and was likely a preferred watering hole for bison (Brumley 1975:92). EgNo-23 is located among a series of low-lying sand dunes that at one time surrounded a shallow ground-water slough. The Cordero site is located close to several tributary drainages of the Belle Fourche River and is also close to a steep sided arroyo that could have been used as a natural trap (Reher et.al 1985:120). In all cases the use of natural landforms may have favoured an ambush style of hunting.

Even with these well-developed techniques most McKean occupations (in both the northern and southern portions of the McKean range) have relatively small faunal assemblages. Often the remains of one or two bison are found among elements from a variety of medium to large sized mammals including deer, pronghorn, elk, canids, and several species of leporids. These smaller assemblages do not indicate the use of

communal hunting and are better interpreted to be the product of successful opportunistic kills. Faunal remains tend to be concentrated around a number of hearth features and both platform and basin-shaped types are commonly encountered. Large slab-lined roasting pits, more typical of McKean sites in the United States, have not been identified in the Canadian Plains although rock-lined hearths have been identified in the Hanna component at Saahkómaapína (Head et.al. 2003) and the McKean Lanceolate component at EgNo-23 (Webster, this volume).

Faunal elements are often heavily processed, especially from larger artiodactyls, indicating marrow removal and pemmican production as important subsistence activities. Large amounts of fire-broken rock are associated with many McKean assemblages supporting the notion that site inhabitants were manufacturing bone grease, however, the large rock filled pits more common in Late Period cultures are rare (see Appendix C; Table C.1 and C.3). Furthermore, these pits tend to be more common at processing sites indicating that pemmican production, like communal hunts, may represent a limited seasonal activity.

3.2 Settlement Patterns

3.2.1 General Patterns

In the absence of well-documented McKean sites there have been few attempts to examine McKean settlement patterns in the Canadian Plains. In his study of Manitoba McKean, Syms (1969) noted that many of the sites were located near large river systems rather than along small tributaries or marshland. While there are indeed a significant number of McKean sites located along major river courses (see Figure 2.13) a recent re-evaluation of McKean site distribution in southwestern Manitoba (Boyd 2000) indicates that people of the McKean complex were selecting areas with a mosaic of wetland and prairie ecosystems. Boyd (2000:39) notes that, "More than any one reason, it is perhaps this characteristic – i.e., the intersection of a number of different resources – which made these locales important points on the Precontact 'economic landscape'."

Beckes and Keyser (1983) noted a similar pattern in a survey of Custer National Forest. The authors note that in the South Dakota portion of the survey McKean sites are commonly associated with low-lying river valleys (Beckes and Keyser 1983:99) and in the Little Missouri National Grasslands of North Dakota there is a pronounced pattern of Middle Archaic sites (including many McKean sites) along a series of linear ridges (Beckes and Keyser 1983:177). These ridges provide a path

from the Yellowstone Drainage in the west to the Knife and Heart River systems in the east. These ridges encompass a number of environmental niches and provide access to a large diversity of flora and fauna. These general patterns indicate a definite preference for areas of high diversity as might be expected by people utilizing a mixed hunting and foraging subsistence economy.

In Saskatchewan, McKean components are common throughout much of the southern portion of the province. Surface collections often contain a relatively large number of McKean projectile points, but large multi-component campsites show a limited distribution along major river systems. The same can be said of multi-component McKean sites in Alberta and Manitoba, although the sample of sites from these areas is small. Also significant is the fact that many of these sites are located in transitional environments, or ecotones, allowing for the potential utilization of a variety of local flora and fauna.

The limited data on seasonality indicate that many of these sites were occupied in the warmer months of the year. Of the 23 McKean occupations identified at Thundercloud, Redtail, Crown, and Cactus Flower only three appear to have been occupied in winter. Of the remaining 20, there is a relatively even split between spring and fall occupations. It appears that, at present, the current sample of McKean occupations represents a portion of a much broader seasonal round. The occupation of major river valleys in the spring of the year likely coincides with the migratory patterns of several species of mammals and a large variety of waterfowl and birds. Fish are also particularly vulnerable during the spawning season and may have been utilized, especially at sites such as Crown, Tailrace Bay, and the Pas Reserve. The re-occupation of these areas in the fall may coincide with reverse patterns of migration as well as local harvesting of a number of seeds, berries, and roots. It is interesting that at the only confirmed McKean kill site in the Canadian Plains (EgNo-23) the analysis of bison mandibles and teeth suggests a mid to late summer kill episode. Unlike the campsites mentioned above this site is located in the open Plains and is well away from a major river system. Future excavations may indicate that summer occupations are more typical in the open grasslands, but unfortunately the sample of sites from these areas is too small for comparative study. Seasonal activity patterns were also examined by Tratebas (1985:144) who concluded that, "...the McKean seasonal round or area of movement was widespread, not confined to a local area." Much of her study relied on sourcing lithic materials to trace localized movement. Unfortunately the most

prevalent lithic materials at McKean sites in the Canadian Plains (such as quartzite, Swan River chert and silicified wood) are either readily available in many areas or require further research to source local varieties. Many McKean occupations in Saskatchewan contain small amounts of exotic lithic materials such as Knife River chalcedony, Montana Chert, and Tongue River silicified sediment. The inclusion of these materials likely indicates continued trade links to populations in Montana and North Dakota, but the actual movement of people into more southern regions should not be ruled out. It is also unfortunate that, at present, most of the McKean assemblages in the Canadian Plains are representative of a variety of campsites and a handful of bison processing areas. To my knowledge McKean assemblages associated with lithic quarries, large-scale tool manufacture, and/or McKean lithic or tool caches have yet to be identified in the Canadian Plains.

3.2.2 McKean Structures

Evidence for the use of structures by people of the McKean complex is relatively rare. In the southern portion of the McKean range (particularly Wyoming and South Dakota) there appears to be a definite preference for the use of caves and rockshelters, however, features such as post-moulds are uncommon and it seems that these settings are rarely altered beyond their natural form. Evidence of a constructed dwelling was first described at Dead Indian Creek. Researchers note that a profile originally interpreted as a cross-section through an old stream channel (Simpson et.al. 1984) has been re-interpreted as the profile of a pit house (Frison 1991). A photograph of the structure (Simpson et.al. 1984:46) indicates that several hearths may have been present in the bottom of the pit. Measurements of the dental eruption pattern from a large sample of mule deer mandibles indicate a winter occupation for the site (Simpson 1984).

The re-investigation of the McKean site also led to the discovery of a pit house and unfortunately, like Dead Indian Creek, the structure was only recognized after the excavation had been completed (Kornfeld and Bach 1995). This pit was approximately 2.5 meters in diameter and up to 50 centimeters in depth. A deep, straight-sided hearth was located near the center of the pit house and fill from the feature included prickly pear areoles and pine seeds. Researchers recorded a series of ash lenses surrounding the pit suggesting continued cleaning and reuse of the hearth. A sample of charcoal from the feature provided a radiocarbon age of 3140±140 rcybp (Kornfeld and Bach 1995:292).

As mentioned previously, the pit house from the Redtail site may also be attributed to McKean and is, at the very least, from a Middle Period occupation. The exact dimensions of the pit house are difficult to discern but an examination of the profile suggests that the feature is 2.5 to 3 metres in diameter. Like the McKean site pit house there is a deep and relatively straight-sided hearth in the center of the structure. Fill from the hearth consists of darkly stained soil with a slightly greasy texture (Ramsay 1993:209). Evidence of oxidation was present in the deepest part of the hearth. Feature samples were collected from Layer 8, but have not been subjected to flotation analysis. The recovery of a bison humerus from a late term foetus or neonate indicates that the structure was occupied in the spring (Ramsay 1993:170).

A final pit house structure may have been excavated at the Red Fox site in southern North Dakota (Syms 1969). The structure was unearthed during the last two days of excavation at the site and could not be adequately examined. Syms (1969:134) reports that the structure had a diameter of over 10 feet (3.3 meters) and a depth of 0.5 to 0.6 feet (approximately 15 centimeters). A fire pit and a cache pit were associated with the living floor and all of the artifacts from this level were located within the confines of the structure. Evidence to determine the season of occupation was not recovered, however, Tratebas (1998) suggests that the presence of a cache pit may indicate a winter occupation.

With the possible exception of the Redtail site, evidence of McKean pit houses is absent from the Canadian Plains and may truly represent a southern McKean adaptation. In fact current evidence from the Canadian Plains indicates that people of the McKean complex may have been using temporary circular tent-like structures. Some researchers have suggested that the features represent a structure similar to the tipi (Brumley 1975; Dyck and Morlan 2001), but they are not associated with the stone rings that are typical of late period tipi sites. An exception may be the discovery of several McKean Lanceolate projectile points within a ring of stones at the Cranford site in Alberta (Stuart 1990). Some caution must be applied to this interpretation since 34 of the 35 discovered rings have been dated to the Late Period. Furthermore, a McKean activity area was uncovered below a different ring feature and raises the possibility of mixing between components.

The best evidence for a McKean structure in the Canadian Plains comes from Level VIII at the Cactus Flower site. Floor plans from this level revealed a circular debris pattern located around a central hearth (Brumley 1975:139). Artifacts are

concentrated in the south and southeastern portions of the structure and a slight gap in the artifacts may indicate the presence of an eastward facing door (Dyck and Morlan 2001). The structure is approximately 4.8 meters in diameter (Brumley 1975:19).

Circular debris patterns have also been recorded in occupations from Redtail (Ramsay 1993), EgNo-23, and Saahkómaapína (Head et.al. 2003). Two of these patterns were noted at the Redtail site, one in Occupation 11 and another in Occupation 12. Ramsay (1993:288) indicates that lithic debitage and fire broken rock are more prevalent in the southern half of the feature in Occupation 11, similar to the pattern described at Cactus Flower. The presence of several immature bison suggests a late spring to early summer season of occupation. The pattern in Occupation 12 also revealed several artifact concentrations in the southern and southeastern portions of the structure (Ramsay 1993:290). A single immature bison, aged to 7 months, indicates a late fall/early winter occupation. Both of the structures have an approximate diameter of 3 meters (Ramsay 1993:313).

Similar patterns were also recorded in Level 2 at EgNo-23 and in Occupation 3 of Block 4 at Saahkómaapína. These patterns are more difficult to interpret than in the previous examples and it seems that only a portion of each feature was uncovered. In both cases researchers recorded artifacts in a semi-circular arc around a central hearth feature. The approximate diameter of the pattern from Saahkómaapína is unknown. The estimated diameter of the circle at EgNo-23 is approximately 3.5 meters. Unfortunately both occupations are associated with a sparse faunal assemblage and seasonal indicators were not recovered.

With the exception of the Cactus Flower site that has a distinct circular pattern of artifacts, it is difficult to propose that the occupants of the remaining McKean habitations were utilizing some form of temporary tent-like structure. In the absence of an actual ring of stones or post-moulds there is nothing to indicate that the artifact distributions from Redtail, EgNo-23, and Saahkómaapína represent anything more than a cluster of well-defined activity areas occurring in proximity to a central hearth. This is especially true of the sites in question since they are generally believed to represent short-term campsites. One can easily imagine a small number of people conducting a variety of localized activities within a relatively close distance to a hearth feature. At EgNo-23, each of these activity areas is separated by 50 to 75 centimeters providing adequate room for a number of individuals to be working concurrently. Regardless, future research will be required at several of these sites before more

definitive statements can be made. Of particular importance is an examination of the relationship between the various activity areas and the recovery of a larger faunal and/or floral sample in an effort to determine season of occupation.

3.3 Summary

At present the apparent dichotomy between the subsistence strategies of McKean populations in the northern and southern portions of the McKean range is not supported by the archaeological data. Evidence from the Redtail site indicates a diverse subsistence base that includes a number of utilized plant species. Previous interpretations of subsistence in the Canadian Plains seem to a have suffered from a lack of adequate recovery methods and, in some cases, poor preservation. Still, there is an obvious dependence on bison at many Canadian McKean sites that is undoubtedly influenced by the environment as much as it is by cultural selection. This research agrees with the idea that the people using McKean projectile points employed a broad-based subsistence strategy that is adapted to local environmental conditions. Hunting of large mammals (such as bison, elk, pronghorn, deer and mountain sheep) is clearly important but the diet is also supplemented by a variety of smaller animals and plants. In this respect, the general McKean subsistence pattern is one of hunting and mixed foraging with sites such as Leigh Cave and Scoggin representing the extremes at either end of the spectrum rather than the norm.

Settlement patterns are more variable in the southern portion of the range and include sites in a wide variety of settings. The distribution of sites in the Canadian Plains appears to be patterned around major waterways and/or areas of high diversity, but this pattern may be the result of increased research related to such environments and, in general, a small sample of sites. The identification of seasonally utilized sites of varying types will be required before definitive statements can be made regarding the nature of McKean settlement patterns in the Canadian Plains. In terms of structures, the Cactus Flower site continues to provide the best evidence of a tent-like dwelling. Similar artifact patterns have been identified at other sites, but these patterns may also represent the activities of a small group of people whose activities were centered around a central hearth feature. The discovery of a pit house at the Redtail site is intriguing and future analysis of this occupation may indicate a McKean affiliation. If so, the Redtail site will become even more important to our understanding of the cultural continuity between McKean populations throughout the Northern Plains.

Chapter 4

McKean Origins

4.1 Overview

As mentioned in the previous chapter, Mulloy (1954) recovered a relatively sparse faunal assemblage at the McKean type-site and many of the identified elements were from small mammals. Numerous manos, metates and slab-lined roasting pits were also identified and hinted at a generalized subsistence base that was unlike that of later Plains bison hunters in this area. In examining the archaeological evidence Mulloy (1954:440) suggested the presence of "...an exceedingly simple economy and cultural life, ...similar to the way of life of such peoples as the Gosiute of the northeastern Great Basin." Such comparisons provided the early basis for arguments that McKean may have originated outside of the Plains environment.

Suggestions of an actual migration by McKean populations resulted, in part, from data collected in the late 1940's and early 1950's during the Angostura and Keyhole reservoir surveys (Wheeler 1995; 1996). Over much of the survey area, Wheeler noted a complete lack of components from the Early Middle Prehistoric period (Early Archaic). The general absence of these assemblages fueled arguments of Plains abandonment during the Altithermal and supported the idea that McKean people had moved into the Plains from elsewhere. At the same time, excavations at sites such as Danger Cave in Utah (Jennings 1957) revealed a long sequence of occupations that included components from the Early Archaic period. These components were also associated with manos and metates, and faunal remains indicated the use of a diverse subsistence strategy. The apparent similarities between the assemblages from the McKean type-site and sites such as Danger Cave led to suggestions that McKean may have originated in the Great Basin, followed soon after by a migration into the Plains as a result of post-Altithermal climatic change (Mulloy 1958; Wedel 1961).

Perhaps the most compelling data in support of these hypotheses are from Leigh Cave in north-central Wyoming where McKean projectile points were found associated with the preserved remains of plant fibers, sinew, cordage, and hide. Small animal and plant remains, including numerous wild onion bulbs and roasted Mormon crickets, are interpreted as a varied diet that is lacking a big-game focus. The presence of manos and metates also seemed to support this interpretation. In light of such a diverse faunal and floral assemblage Frison and Huseas (1968:26) concluded that, "The occupation at Leigh Cave is more reminiscent of a desert culture orientation than that of Plains Indian hunters."

Comparisons of McKean to the cultures of the Great Basin went beyond explanations of subsistence strategy and soon included comparisons of the projectile points from both areas. Detailed investigations of the artifact assemblages from a number of Great Basin sites led to the identification of a regional projectile point sequence known as the Little Lake series (Green 1975). Assemblages associated with the Little Lake series of projectile points were thought to represent a true desert-like adaptation (Jennings 1957). Several of the projectile points within these series (namely the Humboldt and Pinto Basin sub-varieties) bore a striking resemblance to McKean points supporting the hypothesis that McKean origins lie in the Desert Archaic (Spencer and Jennings 1965:40-41)

In an attempt to help resolve the issue Green (1975) conducted a technological analysis of a number of points from the Great Basin in comparison to the sample of points recovered from the McKean type-site. The study revealed important technological differences including the use of parallel oblique flaking on points from the Little Lake series. Basal edge grinding, absent on the McKean site specimens, was also noted on both the Humboldt Concave base and Pinto types (Green 1975:166-167). Furthermore, Green suggests that this technology shows considerable time depth in the Great Basin beginning as early as 9,500 BP and persisting to as recently as 2,200 BP (Green 1975:168). As a result, any resemblance of McKean points to the points of the Little Lake series appears to be entirely superficial.

Husted (1995:80) has also rejected the idea of a Great Basin origin for McKean noting that many of the important cave sites in the northeastern Great Basin appear to have mixed stratigraphy leading to a misinterpretation of the cultural history in these areas. Husted (1991) prefers a mountain origin for McKean as an outgrowth of the Western Macrotradition. The hypothesis was created to make sense of a growing

amount of data from the foothill and mountain regions of Idaho, Oregon, Wyoming, and Montana. Many of these sites contained McKean occupations in association with assemblages that had never been recorded in the Plains, but had been noted in some mountain adapted cultures (Husted 1991:83).

Based on similarities in artifact assemblages between McKean and earlier groups Husted (1995: 44-78) traces the beginning of the Western Macrotradition to the arrival of the Agate Basin complex in the northern Plains. Soon after the arrival it is hypothesized that the complex split into several branches each focusing on separate environmental or ecological zones. Of particular importance to this discussion is the development of two of these branches; the Plains Branch that continued to exploit the Plains environment and the Mountain Branch that moved into the central and northern Rocky Mountains. With regard to the Plains Branch, Husted (1995:53) suggests that:

> By about 8,000 B.P., the population was concentrated on the Plains of Alberta and probably northern Montana as evidenced by Scottsbluff-like and Alberta-like projectile points dated to about 8,000 years. Between 8,000 and 7,500 B.P., these hunters found it necessary to abandon the Plains. They moved westward into the Rocky Mountains and the northern interior plateau. Here began the continuum leading to a part of the McKean Complexes.

As the people of the Plains Branch moved westward the cultural groups associated with the Mountain Branch may have been displaced from the central Rockies. By 5000 BP the Plains Branch population had moved northwards to occupy the Rocky Mountains of southern British Columbia and Alberta while the Mountain adapted groups had drifted back into the central portion of the Rocky Mountain range (Husted 1995:61). Cultural contact is likely to have occurred between these two areas, perhaps in the mountainous regions of northwestern Montana. It is this cultural contact that may have led to the diversity in point styles generally associated with McKean:

> In order to account for the appearance of the side-notched, indented base point in the McKean complex, the simplest explanation seems to be that the displaced mountain-adapted population borrowed the side-notched point style but adapted it to their needs. The attribute of basal indenting was being developed in the post-Cody complex sequence in Canada and contact between the northern group and the mountain-adapted population would explain the appearance of basal indenting in both groups (Husted and Edgar 2002:123).

After 5000 BP post-Altithermal climatic change led to a return to more favorable conditions throughout the Northern Plains and many of these groups moved back onto the grasslands at this time. This would, in part, explain the occurrence of separate point styles at some sites and a co-occurrence of styles at others.

Archaeological evidence from several areas seems to support some aspects of the Western Macrotradition hypothesis. Benedict and Olson (1973) use data from the Fourth of July site in northeastern Colorado to suggest a transitional relationship between terminal Paleo-indian points and later McKean varieties. Several points were identified that appear to be transitional in form between James Allan and McKean Lanceolate, as well as between Pryor Stemmed and Duncan. Radiocarbon dates of 5880±120 BP and 6045±120 BP are also transitional and agree with this interpretation (Benedict and Olson 1973:325). Like Husted, these researchers believe that the Plano progenitors moved to higher altitudes to seek refuge during the height of the Altithermal.

Excavations in the Lochnore-Nesikep locality in the interior of British Columbia also revealed a series of point styles that included earlier Plano-like varieties dated to 6000 BP and later stemmed and lanceolate varieties that appear similar to McKean points (Sanger 1967:192). Husted (1995) suggests that the Nesikep Tradition may represent the predecessor of the stemmed and indented base points (such as Duncan and Hanna).

Black (1991) dismisses the Western Macrotradition hypothesis and finds little evidence to connect mountain-adapted groups to the Agate Basin complex noting that there is widespread evidence for the Mountain Tradition throughout the Central and Southern Rockies by 8000 BP and perhaps as early as 10000 BP. These populations predate, or are concurrent with, the arrival of Agate Basin in the Plains and therefore Agate Basin cannot be a direct predecessor of the Mountain Tradition. In the Central Rockies there is considerable continuity in the adaptive strategies of the Mountain Tradition until 4500 BP with the arrival of McKean. In the Southern Rockies there is little evidence for McKean, and the Mountain Tradition continued uninterrupted for as much as 9000 years.

Other researchers appear to place more emphasis on radiocarbon dates in searching for the origins of McKean. Syms (1969) was one of the first to compile and compare such data. Citing dates from sites such as Sorenson, Sweem Taylor, Grey-Taylor, and Rigler Bluffs, Syms (1969:163) notes that the earliest dates are clustered in the mountain ranges surrounding the Bighorn Basin. The sequence of dates also supported the rapid expansion of the McKean complex into much of the Northwestern Plains. Unfortunately Syms had to rely on a relatively small sample of radiocarbon dates and some of these samples were processed using early techniques that are now

considered unreliable (Morlan 1993). Tratebas (1998) notes that since 1969 the number of McKean radiocarbon dates has increased steadily and that early dates have been recorded in many areas. Even so, some researchers continue to suggest that the Bighorn Basin (Frison 1991) or Yellowstone drainage (Dyck and Morlan 2001) provide the best evidence for early McKean sites.

In recent decades an increasing amount of archaeological evidence argues against a total abandonment of the Plains during the Altithermal (Reeves 1973; Walker 1992). The movement of people into high altitude refugia is a key factor in deriving McKean from earlier mountain adapted groups. As such, some of the more recent hypotheses suggest a Plains origin for McKean as a development from previous *in situ* populations (Keyser and Davis 1985; Tratebas 1998; Wright 1995).

Keyser and Davis (1985) agree that the mountainous regions of Wyoming and Montana represent the likely homeland for McKean but note that the archaeological record does not support a migration of people from this area. McKean adaptations tend to be regional in nature, a fact that is best explained by, "...the spread of McKean as diffusion of a techno-complex through a series of in situ Northwestern Plains populations." (Keyser and Davis 1985:130). The rapid expansion of McKean may be related to the adaptability of the lithic toolkit that can easily produce a number of tools from large bifacial blanks (Keyser and Fagan 1993).

Tratebas (1998) also argues for diffusion, rather than migration, as a mechanism to explain similarities between the Great Basin and the Black Hills region. Her analysis of petroglyphs from the Black Hills shows that the sequence is continuous from the early Paleo-Indian period to the Late Archaic. The overall style of the rock art changes gradually through time and does not support an influx of people. There are some stylistic and technological similarities between the petroglyphs from the Black Hills and the Great Basin leading to the suggestion that the people from these two areas may be related (Tratebas 1998:283). Tratebas (1998:281) also notes that parallel oblique flaking is present on early or transitional McKean Lanceolate points from surface contexts within the Black Hills of South Dakota. The earlier Plano-like points from both the Fourth of July site and the Lochnore-Nesikep locality exhibit diagonal flake patterns (Benedict and Olson 1973:325; Sanger 1967:192), the same features used by Green (1975) to argue against the relationship of McKean to the Little Lake series. The evidence may, in fact, support the early relationship but does not necessitate an actual migration from the Great Basin area.

4.2 McKean in the Canadian Plains

The Mortlach site (Wettlaufer 1955) provided one of the first excavated McKean components in Canada. The lowermost levels revealed at least three stemmed and concave-based points identified by Wettlaufer as belonging to the Thunder Creek culture (Wettlaufer 1955: 58). Wettlaufer (1955:79) noted definite similarities in style between Thunder Creek and the then newly defined Duncan and Hanna points in the northern United States concluding that, "The Thunder Creek people would seem to be a northern extension of a group of people whose hunting territory extends from central Saskatchewan to at least Nebraska, and possibly farther." Wettlaufer (1955:79) also noted similarities to Pinto Basin points and suggested the possibility that the overall point style represented a, "generalized culture used over the whole Plains region at this time level."

From the mid-1950's to the early-1980's excavated McKean components remained relatively rare in Saskatchewan. Notable exceptions include Long Creek, Billet, Big Kill, and Sullivan (see Chapter 2), however, many of these sites have relatively small components or were associated with disturbed deposits that retained little of their original provenience. Still, McKean projectile points were commonly recovered in surface collections revealing a widespread distribution in the southern portion of the Province. In the absence of excavated and published data the earliest hypotheses on the expansion of McKean into the Canadian Plains came from Alberta and Manitoba.

Syms (1969) provided the first in-depth examination of the spread of McKean into the Canadian Plains. By plotting the available McKean radiocarbon dates, Syms noted a cluster of early dates in the mountains surrounding the Bighorn Basin in Wyoming (Syms 1969:163). More importantly many of the areas farthest from the Bighorn Basin (such as Saskatchewan, North Dakota, and Colorado) were associated with some of the latest radiocarbon dates supporting the possibility of a migration from the core region. Syms also noted that many of the sites in Manitoba and Saskatchewan were associated with large river systems and that McKean likely entered Manitoba from the west, suggesting that the Saskatchewan River was a likely route for such an expansion to take place (Syms 1969:175). Ramsay (1993) re-examined the radiocarbon evidence and updated the McKean chronology for many of the regions. The new data suggest that McKean appears much earlier than originally

believed in some of the outlying areas, but the earliest radiocarbon dates continue to be recorded in the Bighorn Basin and surrounding mountain ranges, supporting Syms' original hypothesis.

Other researchers have argued for a Great Basin origin followed by a migration after the amelioration of the Altithermal (Brumley 1975; Reeves 1983). Brumley (1975: 102) draws parallels between the environments of the Great Basin and northwestern Wyoming leading to the retention of an archaic subsistence strategy in these areas (such as at Leigh Cave). The northward migration of McKean into prairie landscapes dominated by bison led to the abandonment of the archaic subsistence base in favour of a specialized strategy focused almost entirely on bison. Reeves (in Vickers 1986: 68) considers that as McKean expanded into the Canadian Plains the associated population encountered people of the Oxbow complex who were then pushed into the parkland and boreal forest.

Wright (1995) disagrees with the idea of a population movement and argues that there is sufficient evidence to support a direct relationship between Oxbow and McKean. Wright's (1995:300-332) argument for cultural continuity is based on stratigraphy, similarities in artifact assemblages, and evidence for shared ideology. The observation that Oxbow assemblages are consistently found below McKean in sites with well-developed stratigraphy is correct (Wright 1995:300). Oxbow and McKean projectile points have a similar distribution, but in large multi-component sites (such as Long Creek, Thundercloud, Cut Arm, Saahkómaapína, and EgNo-23) Oxbow assemblages are always located below McKean. Furthermore, these assemblages are generally well-separated and reliable evidence of the direct association between Oxbow and McKean has yet to be recorded. The lithic toolkit is also similar between Oxbow and McKean and commonly recovered artifacts include scrapers, flake tools, large bifacial knives (often side-notched), and projectile points (Wright 1995). Classic Oxbow "eared" projectile points are easily distinguishable from McKean, however, Oxbow components are also associated with triangular preforms that are similar in style to McKean Lanceolate points (Green 1998; Dyck 1977).

Stratigraphy provides some of the best evidence to support the derivation of McKean from Oxbow, and the lack of sites with components containing both McKean and Oxbow projectile points is difficult to explain. Perhaps the people of the Oxbow Complex were limited to small bands that were easily dispersed by the advance of the McKean population. Whatever the case, to assume that McKean is derived from

Oxbow ignores much of the data from the United States. A survey of the literature clearly indicates that most Canadian researchers would agree, favouring expansion over *in situ* development (Brumley 1975; Dyck and Morlan 2001; Ramsay 1993; Reeves 1983; Syms 1969). In light of the new research presented in Chapter 2, the case for McKean migration seems even stronger and must therefore be examined in greater detail.

4.3 Evidence for a McKean Migration

4.3.1 Migration Theory

It should be clear from the overview that a number of researchers support the idea of a McKean migration (Brumley 1975; Dyck and Morlan 2001; Husted 1995; Mulloy 1958; Pettipas 1996; Ramsay 1993; Reeves 1983; Syms 1969; Wedel 1961), yet rarely are these hypotheses evaluated against a framework of migration theory. Anthony (1990:895) indicates that, "migration has been avoided because archaeologists lack the theory and methods that might allow them to incorporate migration into the explanation of culture change, not because migration is regarded as unimportant." In fact, it has been argued that a procedure by which researchers could diagnose the archaeological evidence of migration does not even currently exist (Burmeister 2000). This is not to suggest that there is a complete lack of theory in general. On the contrary, many of the social sciences have continued to explore migration as an explanation for culture change, but these interpretations rely heavily on the use of historic or modern ethnographic data to test such hypotheses. Archaeologists are commonly faced with a limited amount of data and this is especially true for pre-contact archaeologists who are often working with the remains of cultural groups that lacked written records or traceable oral histories. In rare cases pre-contact archaeologists can utilize data from skeletal biology to infer migration (see Owsley and Jantz 1994), but such instances are rare in the Northern Plains. As a result, researchers must generally rely on the identification of intrusive site elements, however, for most artifact inventories it is very difficult to differentiate traits that are truly intrusive from those that have been accepted into a cultural group by diffusion. Clearly then, interpretations of migration from archaeological assemblages must be presented with some caution, especially in the Northern Plains where cultural adaptations are generally quite similar from one group to the next.

Renewed interest in migration from an archaeological perspective (Anthony 1990; Burmeister 2000; Crawford and Smith 1996) will undoubtedly lead to better methods of analysis and interpretation. Even so, a basic framework exists by which a general inference can be made. For instance Rouse (1958:64) outlines five criteria to effectively demonstrate that a migration has occurred:

> (1) identify the migrating people as an intrusive unit in the region it has penetrated; (2) trace this unit back to its homeland; (3) determine that all occurrences of the unit are contemporaneous; (4) establish the existence of favourable conditions for migration and (5) demonstrate that some other hypothesis, such as independent invention or diffusion of traits, does not better fit the facts of the situation.

Using these basic guidelines a case for a northern migration of McKean can be presented and discussed.

4.3.2 Evidence of Migration from McKean Cultural Assemblages

The primary method of identifying McKean assemblages in the Canadian Plains is the recovery of one or more projectile points that are readily recognizable as McKean Lanceolate, Duncan or Hanna. This may sound like an obvious statement, especially in Plains archaeology where many cultural entities are identified primarily by the style of associated projectile points; nonetheless, Tratebas (1998:298) has challenged the identification of McKean in the Canadian Plains suggesting that any resemblance to McKean may be entirely superficial. While it is true that there have been no technological comparisons between the artifact assemblages in the northern and southern portion of the McKean range, McKean points represent distinct morphological types that are readily recognizable in the archaeological record. This is especially true of the McKean Lanceolate point as it represents the return to a point style (lanceolate in design) that was last utilized in the Canadian Plains by Early Paleoindian hunters. Based on a direct examination of the projectile points from the McKean type-site and Dead Indian Creek, this author is confident that sites from the Canadian Plains do indeed represent McKean. For example, McKean Lanceolate points from the Big Kill site in Saskatchewan (see Dyck 1983:102) are indistinguishable in shape from similar varieties at the McKean site. Likewise the large collection from the Sullivan site (Johnson 1975) includes as many as 41 diagnostic projectile points, many of which are typical of the Duncan style. Some of these (see Johnson 1975:13) are nearly identical in shape to points described by Keyser (1985) at the sites of Red Fox and Lightning Spring. Moreover, like many of the sites in the southern portion of

the McKean range there are McKean sites on the Canadian Plains that contain all three of the point varieties. Such an association can hardly be described as coincidence or the result of parallel developments given the similarities in the rest of the material culture.

This is not to suggest that all assemblages are identical and, indeed, there is considerable variation from one region to the next. Such variation should not be surprising over such a large geographic area. For example, qualitative observations of the projectile points from sites mentioned previously indicates that Canadian McKean points tend to be shorter and wider than their American counterparts. Saskatchewan McKean points are often extensively re-worked, perhaps related to the lack of high quality lithic materials that are more common in the southern regions. Lateral edge serrations are also present on several of the points from both Dead Indian Creek and McKean, but have not been recorded from sites in the northern range. Quantitative analyses of projectile points from both areas will be necessary before technological similarities and differences can be described.

Clearly, the recognition of a new projectile point style does not indicate an intrusion of a new cultural group into the Canadian Plains. As outlined in Chapter 3 the lack of grinding stones, slab-lined roasting pits, and differences in the faunal assemblages has led some researchers (Davis and Keyser 1999; Tratebas 1998) to suggest that the presence of McKean in Canadian sites is better explained by diffusion of point styles rather than as evidence for migration. New evidence from the Redtail site indicates that seeds, and likely grinding stones, are associated with some McKean campsites in the Canadian Plains. The grinding stones are of particular interest because they have no precedence in this region and therefore must be related to migration or, far less likely, cultural transmission from the south. Future examination of the pithouse from the Redtail site may also reveal evidence of a McKean occupation. Regardless, pit house structures are not associated with earlier cultural groups in this area and the presence of this feature is also indicative of a new cultural adaptation.

The best evidence for cultural continuity between McKean populations in the northern and southern portions of the Northwestern Plains comes from the recovery and analysis of McKean burials. As many as seven McKean burials have been described to date including two from the McKean type-site (Haspel and Wedel 1985; Mulloy 1954), one from Dead Indian Creek (Gill 1984), one from the Crown site (Walker 1986), one from the Graham site (Walker 1984), and possibly two from the

Gray Burial site (Millar 1978). Mulloy (1954) discovered the first McKean burial in 1951 in the lower occupation at the McKean type-site. The burial was discovered in a pit approximately 45 centimeters (1.5 feet) wide and 60 centimeters (2 feet) deep. In the bottom of the pit researchers discovered a fragmented human cranium and two fragmentary bison innominates. No other grave goods were recorded. A number of "old" or dry bone fractures were recorded on both the cranium and innominates indicating the presence of a secondary burial (Mulloy 1954:442). Cranial characteristics suggest that the individual was a female approximately 30 years of age (Stewart 1954:457). A second burial was recorded during the re-analysis of the McKean site in 1983 (Haspel and Wedel 1985). The burial was also found in the lower occupation and was situated approximately five meters from the 1951 burial described by Mulloy. Like the previous burial, human remains were also encountered in a pit that was approximately 1 meter in diameter and as much as 45 centimeters in depth. Recovered skeletal remains include a fragmented cranium, six teeth, a mandible fragment, and several fragments from a scapula and humerus (Haspel and Wedel 1985:105-106). Once again the fragmentary nature of the specimens is indicative of a secondary burial. No grave goods were directly associated with the burial, but a hematite slab and a fragmented deer pelvis were found near the top of the burial pit. The age of the individual is estimated at five years, based on the level of dental development and eruption (Haspel and Wedel 1985:106).

The burial at the Dead Indian Creek site was also in a shallow pit located directly below the living floor (Walker and Frison 1984:113). Grave offerings were not associated with the burial. With the exception of a single tooth all of the remains are post-cranial and include a number of limb elements (primarily bones of the hands and feet), a sternum fragment, and several ribs (Gill 1984:97). The developmental stage of the single tooth combined with measurements of long bone diaphyses and epiphyseal development indicate that the individual was between 8 and 9 years of age at the time of death. The small number of slightly scattered elements indicates the presence of a secondary interment (Walker and Frison 1984:113).

The Crown site burial extended below the lowermost Hanna occupation and was also located in a shallow pit, measuring approximately 80 centimeters in length and 30 centimeters in width (Quigg 1986:114). The skeleton was relatively intact and was placed in an extended position. Grave goods and red ochre pigment were not associated with the individual. Using schedules for dental eruption in combination with

radiographs and measurements of the mandibles, Walker (1986:250) estimates that the individual was 2.5 to 3 years of age at the time of death. Gender could not be assessed.

Walker (1984) also describes the burial from the Graham site. The Graham burial is unique in that the human remains were discovered within and around a shallow hearth feature. A total of 1108 burned and calcined bone fragments were recovered from within the hearth and most were identified as human. Several unburned human elements were also recovered immediately outside of the hearth. Eruption of the third molar indicates that the individual was older than 18-20 years of age and minimal wear on the third molar confirms that the individual was a relatively young adult (Walker 1984:140). Cut marks on the margin of one rib fragment and even burning on the articular and non-articular surfaces of the longbones suggest that the individual was dismembered prior to burning. The presence of multiple longitudinal fractures and minor checking indicates that the bone was burned in a dry state leading to the interpretation that the interment represents the cremation of a bundle burial (Walker 1984:142). Two tools (a Duncan point and a hafted biface) were also recovered within the hearth and may represent grave goods.

From the available evidence there is considerable continuity in McKean burial patterns. With the exception of the materials from the Gray Burial and Graham sites, all of the burials were recovered in shallow pits, lack grave goods and are not associated with red ochre pigment. The cremation burial at the Graham site is enigmatic but in many ways still conforms to the general burial pattern for McKean. For instance, the burial was discovered in a hearth feature that was excavated into the primary living floor. Also, like many of the burials, it represents a secondary interment. More importantly, these patterns are very different from the burial practices utilized by people of the Oxbow complex. Of the five reported Oxbow burials, four are isolated interments located away from campsites and the fifth is the Gray Burial site (Walker 1984:149). All of the Oxbow burials are associated with red ochre and three of the four isolated interments are primary extended burials. Such a radical departure from the typical Oxbow mortuary style by the people of the McKean complex does not support the *in situ* development of McKean and is better explained by migration.

The replacement of Oxbow by McKean may also be indicated by the radiocarbon data from the Gray Burial site. Morlan (1993:64) notes that the radiocarbon dates appear to be clustered into two separate periods of use. The first

cluster includes nine dates that range from 5150±160 rcybp (SFU-294) to 4340±250 rcybp (GX-3373). Four of the nine samples are directly associated with Oxbow projectile points. The second cluster includes five dates ranging from 3755±100 rcybp (S-646) to 3415±105 rcybp (S-1450) and are separated from the previous cluster by as much as 600 years (Morlan 1993:19). Diagnostic projectile points were not associated with these samples. It is important to note that four of the five most recent radiocarbon dates were obtained from insoluble collagen extraction, a method that can produce younger than expected dates (Morlan 1993:19). If, however, the dates are relatively accurate it is entirely possible that the second cluster represents a different pattern of site usage that is not related to the Oxbow complex. Millar (1981) indicates that many of the secondary bundle burials had disturbed earlier interments, also supporting multiple periods of use. This second period of use may be related to the arrival of McKean, indicated by the recovery of at least two McKean Lanceolate projectile points (specimens 114.15 and G8 B3.1) from excavated contexts (see Millar 1978:273). Millar (1978:271) describes the projectile points as basally indented leaf-shaped points. The finished appearance of the basal ends leads Millar (1978:275) to suggest that they may represent finished artifacts rather than Oxbow preforms. Unfortunately, radiocarbon dates are not associated with either of the points. McKean Lanceolate projectile points were also recovered from surface contexts at the Gray Burial site (Morlan 1993) and Millar (1978:309-310) notes the recovery of several "grinding stones", one from the surface and another in excavation. Such evidence provides further support for the possibility of a later McKean component and may even indicate the continued use of the cemetery by these McKean populations.

The available data support the appearance of several new traits in the Canadian Plains. This includes new artifacts (projectile points, grinding stones), ideology (burial patterns), and subsistence strategies (broad based foraging, including seeds) for McKean populations. The development of new traits is not, in itself, enough to support the intrusive nature of a new cultural group. To strengthen the interpretation it is important to not only show that traits are new to the region, but to also demonstrate that the traits have antecedents in the area of origin and none in the new area of development (Adams et.al. 1978; Trigger 1968; Willey et.al. 1956). An argument has already been made to separate McKean from the preceding Oxbow complex. More importantly, traits commonly associated with 'southern' McKean populations do have antecedents in those areas. For example, Early Archaic assemblages from

northwestern Wyoming are associated with pit houses (Larson 1997) and grinding stones (Frison 1991) and evidence for projectile points that are transitional to McKean has been suggested for sites in Colorado (Benedict and Olson 1973) and South Dakota (Tratebas 1998). Such traits, in combination with radiocarbon evidence, can be used to examine the second criterion: tracing the McKean population to its homeland or point of origin.

4.3.3 McKean Radiocarbon Dates

Thirty-four years after the original analysis, Syms' (1969) assessment of McKean radiocarbon dates continues to play an important role in interpreting the expansion of McKean into the Canadian Plains. Ramsay (1993:337-344) updated the McKean chronology in the 1990's, adding a wealth of new data and separating the sequence into site clusters (defined by physiographic region). Much like Syms, Ramsay (1993:343) concluded that the earliest dates were associated with the Bighorn Basin and surrounding mountain ranges. A multitude of new McKean components and associated radiocarbon dates have been inventoried since 1993. This is especially true in Saskatchewan and, as a result, the sequence should once again be evaluated.

A list of dated McKean components is included in Appendix C, Table C.5. In an effort to compare the results from differing sample media (charcoal, bone, etc.) all of the radiocarbon dates are presented here in normalized form. Following Syms (1969:164), Figure 4.1 plots the mean value of the earliest McKean radiocarbon dates from each region. With the possible exception of an early date from the southern portion of the Black Hills, the earliest known McKean radiocarbon dates are associated with the headwaters of the Yellowstone River and the mountains surrounding the Bighorn Basin. Furthermore, areas that are the farthest from the "core region" exhibit some of the latest dates. These trends are intriguing and appear to support Syms original assessment, but the overall methodology is too simplistic to draw any specific conclusions from the data.

Following Ramsay (1993:340) a more detailed examination of McKean radiocarbon dates is preferred. Each of the 120 available dates was separated into a general geographic area (Bighorn Basin, Black Hills). Dates were then plotted in the order from earliest to most recent for each area including the 2-sigma standard deviation (Figure 4.2). Once again there appears to be a clear trend towards older McKean radiocarbon dates from the region surrounding the headwaters of the

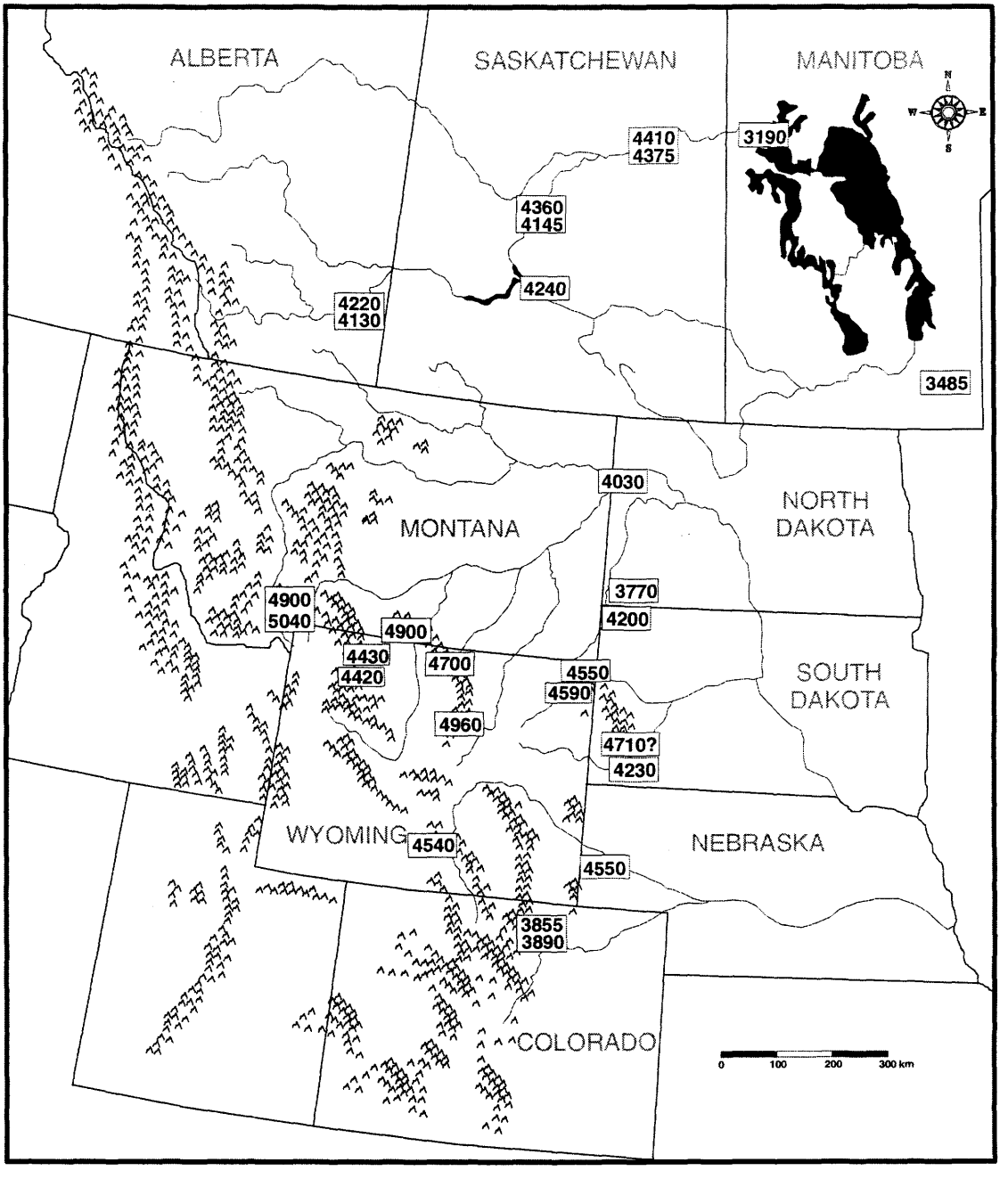

Figure 4.1. Early McKean Radiocarbon Dates (Mean Normalized rcybp).

Yellowstone River and the mountains of the Bighorn Basin. Mean values generally cluster around 4900 BP and have been recorded at sites such as Rigler Bluffs (Syms 1969; Frison 1991), Sorenson (Husted 1991), and Granite Creek Rockshelter (Frison 1991). Somewhat later dates, between 4700-4500 BP, are recorded in the Black Hills region of Wyoming and South Dakota, as well as at sites along the Platte River.

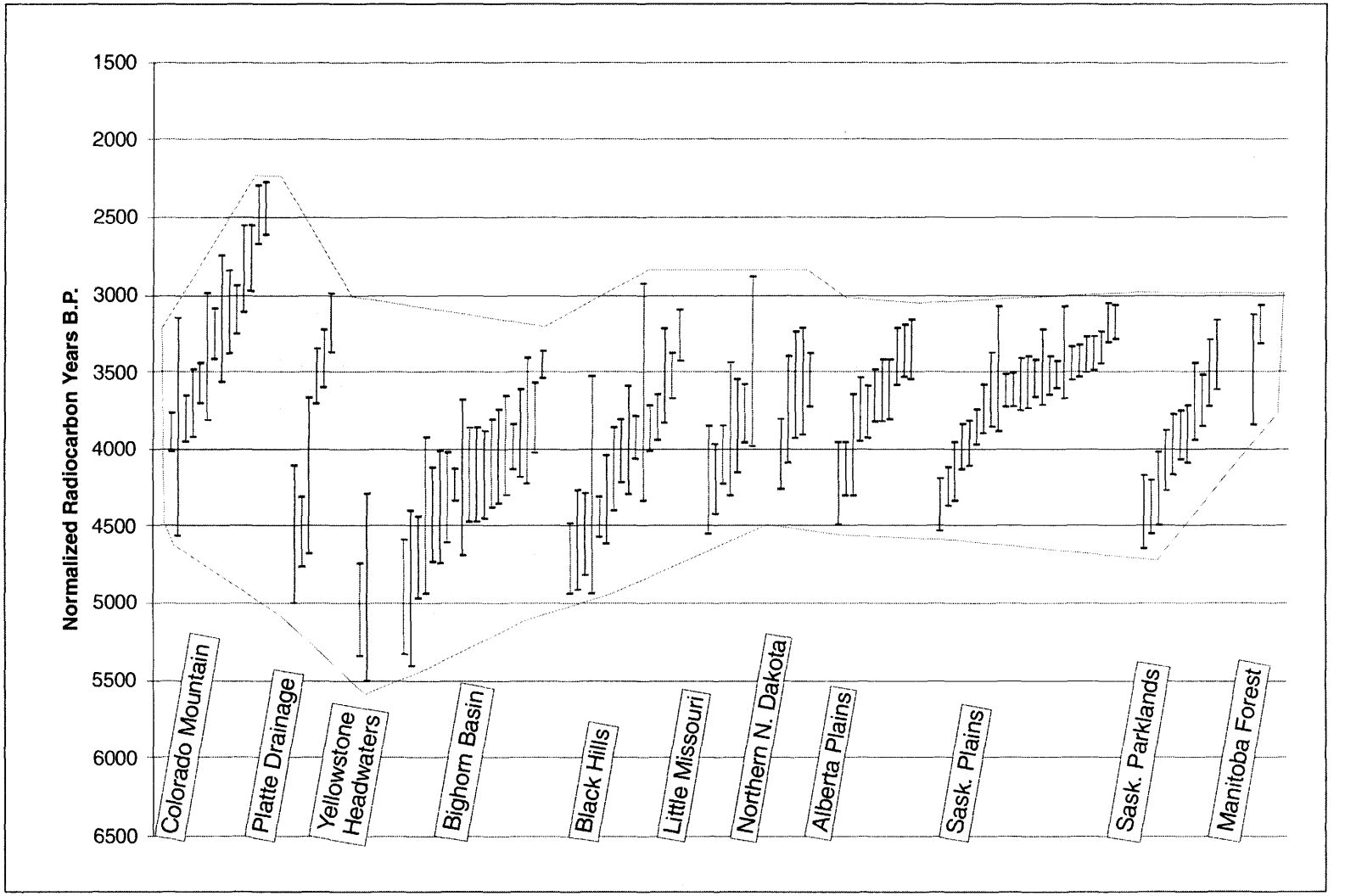

Figure 4.2. Normalized McKean Radiocarbon Dates (2-Sigma Age Range) By Geographic Area

Examples include McKean (Kornfeld and Frison 1985), Red Canyon Rockshelter (Tratebas 1998), Scoggin (Lobdell 1973), Signal Butte (Forbis 1985), and possibly Beaver Creek Shelter (Martin et.al. 1993).

What follows appears to be a relatively rapid northward expansion leading to the widespread recognition of McKean in the remainder of the Northern Plains by 4500 BP. This expansion is only slightly later (4300 BP) in the foothill and mountain regions of Colorado, generally considered the southern limit of the McKean range. Aside from the dramatic increase in the number of radiocarbon dates this pattern remains very similar to the one originally proposed by Syms (see Syms 1969:166). Such a distribution supports a rapid horizontal expansion of McKean soon after the initial appearance in the core region. It is more difficult to identify an actual route of migration. Syms (1969:175) suggests that people of the McKean complex may have moved into Manitoba along the Saskatchewan River system. The large number of multi-component McKean sites associated with large river systems may support this assumption. Large river systems form a network of readily identifiable landmarks, they can provide easy routes for travel, and generally give access to a greater diversity of flora and fauna. Regardless of the exact route, the presence of small amounts of exotic lithic material in Canadian McKean sites indicates a southern point of origin. Examples include Knife River chalcedony (Cactus Flower, EgNo-23, Redtail, Thundercloud, Sjovold, Long Creek, Big Kill, and Cranford), Tongue River silicified sediment (EgNo-23, Redtail, Lubyk), Montana chert (Cactus Flower, EgNo-23, Cranford), Wyoming or Montana silicified siltstone (Cactus Flower; Brumley 1975:71, possibly Tongue River silicified sediment), and silicified volcanic ash (Cranford). The presence of these materials indicates either a direct connection to southern lithic quarries or the persistence of trade relations with more southern populations. The tendency for McKean to utilize local lithic materials may favor the former interpretation.

The plot of available radiocarbon dates also satisfies Rouse's (1958:64) third criterion by proving the contemporaneity of McKean. Based on the radiocarbon mean, McKean appears to have developed in the core area shortly before 5000 rcybp. The horizontal spread of McKean traits soon followed but populations continued to develop in the core region as well. By approximately 4400 rcybp McKean was well established throughout the Northern Plains and continued to persist in all areas until approximately 3200 BP. It seems that, with the exception of a few sites in the Colorado Rockies, McKean disappeared from all areas at approximately the same time. This

phenomenon is likely related to the development of Late Period (or Late Archaic) bison hunters in the Northern Plains. These later groups are identified by a variety of corner-notched projectile points known as Pelican Lake and Yonkee. The relationships between McKean and these later groups are poorly understood, however, it has been hypothesized that McKean may be the direct predecessor to both of these cultural entities (Frison 1991;Reeves 1986).

4.3.4 Motives for Migration

It is likely that the impetus for a McKean migration is multi-causal; nonetheless the spread of McKean has often been tied to the amelioration of the warmer and drier conditions of the Altithermal period. Antevs (1955:328-329) coined the term Altithermal in reference to North American evidence of a general increase in temperature and aridity for the period between 7500 to 4000 BP. A large body of paleoenvironmental research has accumulated since 1955, and the regional affects of the Altithermal have played a role in many of these debates. Analyses have clearly shown that the effects of the Altithermal were geographically variable (Bryson et.al. 1970;Vance 1991;Walker 1992) and perhaps even site specific within localized regions (Beiswenger 1995). Still, it is generally accepted that the peak of this trend occurred between 7500-5000 BP in the Northern Plains (Buchner 1980;Walker 1992). The end of the Altithermal, between 4000-5000 years ago, marks a gradual return to the cooler and moister conditions of the Sub-Boreal period. Evidence from proxy models of past climate change in the Canadian Plains indicates that moister conditions were present by at least 4000 B.P., and perhaps earlier. For instance, a study of pollen and plant macrofossils in sediment cores from Chappice Lake in southeastern Alberta revealed a decline in *Rupia* pollen and seeds after 4400 B.P. (Vance et.al. 1992). *Rupia* (widgeon grass) thrives in shallow, saline waters and are abundant in samples dating from 6000 to 4400 B.P. (Vance et.al 1992:881). *Chara* (muskgrass), a species that cannot tolerate hypersaline conditions, becomes increasingly abundant between 4400 to 2600 B.P. (Vance et.al. 1992:881). Such evidence indicates a decrease in the salinity of Chappice Lake after 4400 B.P., believed to be the result of rising water levels (Vance et.al. 1992:881).

In a comparable study of 28 lakes and bogs in central Alberta, Schweger and Hickman (1989:1830) noted similar observations: "In central Alberta, pollen records from Smallboy Lake, Hasting Lake, and Elk Island Pond indicate the onset of a cooler, more moist climate about 4000 years ago...". Like the study at Chappice Lake, these researchers noted a steady decline in the occurrence of *Ruppia* pollen in a number of

lakes, noting a general dilution of these water bodies (as a result of rising water levels) after 4,000 B.P. (Schweger and Hickman 1989:1832).

A similar interpretation is also provided by Boyd (2000) in his study of stratigraphy and plant phytoliths from sites in the glacial Lake Hind Basin of southwestern Manitoba. Throughout the study area, Boyd (2000:36) recorded an increase in phytoliths from the Chloridoideae (warm/dry short grasses) and Panicoideae (warm/moist tall grasses) subfamilies after 4100 B.P., leading to the conclusion that, "...between 4,100 and 3,300 BP the area was characterized by extensive eolian landscape stability and widespread growth of prairie taxa on uplands in the south-central Hind Basin." Combing this data with observations of site sediments, Boyd (2000:38) concludes that, "Since there is also strong evidence for the development of a high water table prior to the late Holocene, by at least 4,000 BP the region had probably developed into a large mosaic of wetland and prairie."

These studies suggest that in many areas the development of the Sub-Boreal led to widespread landscape stabilization and increased water tables, recognizable in the archaeological record by the development of relatively thick Ah horizons (Boyd 2000:36). Given the general time frame for these periods, the McKean complex appears to have developed at the end of the Altithermal but widespread movement did not occur until conditions were favorable for expansion. If we are to accept that McKean initially developed in the mountains and foothills surrounding the Bighorn Basin it seems likely that the people of the McKean complex would have increased their utilization of the surrounding grasslands during the Sub-Boreal period. This expansion may have initially been associated with major waterways and the generally high diversity of flora and fauna associated with these ecosystems. Such evidence may explain the identification of McKean sites in productive environments throughout the southern portion of the McKean range, but the relatively rapid expansion of McKean into the Canadian Plains cannot be explained by environmental factors alone.

McKean is generally associated with a population explosion, especially when compared to the lack of evidence for Early Middle period (or Early Archaic) components in the Northern Plains. Clearly these earlier components are under-represented in the archaeological record and landscape erosion, as a result of increased aridity, would have led to the destruction of many Altithermal-aged sites. Furthermore, the increase in moisture associated with the Sub-Boreal would have increased flooding and deposition in alluvial environments resulting in the deep burial

of many Early Middle period assemblages. Even so, Frison (1991:193) notes that the McKean complex dominates the Middle period in the Northwestern Plains. Regardless of the population numbers from the Early Archaic there seems to be a relatively large number of McKean sites throughout the southern portion of the McKean range. Given that McKean adaptations reflect a broad-based subsistence strategy (especially in Wyoming) the expansion of McKean into the Canadian Plains may also be related to increased population pressure and the need to exploit new areas with highly diverse ecosystems. Such a migration is likely to have been slow, but constant, perhaps similar to what Anthony (1990:903) refers to as a migration stream:

> The structure of many migrations resembles a stream...Migrants tend to proceed along well-defined routes...Archaeologically this should result in artifact distributions that follow a specific line of movement, though such sites might be transitory or difficult to identify.

In the case of McKean, well-defined routes are likely to have been along major river systems such as the Powder, Yellowstone and Missouri. Expansion along the Missouri drainage would eventually lead to the Saskatchewan River system and access to much of the Canadian Plains. This may explain the prevalence of multi-component McKean sites along these river systems and their tributaries.

Migration streams are also often associated with return migrations (Anthony 1990:898) and a pattern of both expansion and contraction along the migration route. Such movements allow for continued cultural contact along the margins of expansion and may explain the overall lack of McKean winter camps in the Canadian Plains. The presence of small amounts of exotic lithic material, mainly from around the Knife River and Tongue River systems, supports continued cultural contact with this region.

4.3.5 Exploring the Alternatives

The fifth criterion requires an examination of alternative hypotheses to explain the sudden appearance of McKean in the Canadian Plains. Several of these hypotheses have already been mentioned. Wright (1995) supports the *in situ* development of McKean from the previous Oxbow complex. The most convincing argument for such a hypothesis is the fact that Oxbow components are always situated stratigraphically below McKean. In good contexts McKean points have never been found in association with Oxbow, nor have they been recovered below a later Oxbow occupation. In Saskatchewan, acceptable Oxbow radiocarbon dates range from 5500 to 3860 rcybp (Morlan 1993) while McKean dates range from 4410 to 3150 rcybp.

These age ranges suggest that Oxbow and McKean co-existed for a period of at least 500 years and evidence of co-habitation should be present at some sites.

The lack of associated Oxbow and McKean components may be related to the relatively short overlap in age ranges, especially when we consider that many of the most recent Oxbow radiocarbon dates are from components located on the border of the Plains. For example, a trend surface analysis of Oxbow complex radiocarbon dates indicates that the population was slowly pushed towards the north, with the latest radiocarbon dates recorded in the Aspen Parkland and Boreal Forest (Spurling and Ball 1981). The reasons for such a movement are unclear. Gibson (1981) and Reeves (in Vickers 1986) indicate that the movement may have been due to population pressure from the south (related to movement by McKean) while Buchner (1981) suggests that increasingly harsh winters decreased bison numbers and increased reliance on forest resources. Green (1998) notes serious problems with the study by Spurling and Ball and, in light of new evidence, a re-analysis of Oxbow radiocarbon dates is required. Even so, many of the late Oxbow dates are from sites on the periphery of the Plains (see Green 1998; Appendix) indicating a general decline of Oxbow populations in the grassland regions prior to the arrival of McKean. As a result, cultural contact between Oxbow and McKean may have been extremely limited and an overlap of projectile points should not be expected to have occurred. Interestingly, stratigraphic evidence may also support the decline of Oxbow prior to the arrival of McKean. At sites such as Thundercloud (Webster 1999), Long Creek (Bryant 2003), Cut Arm, and EgNo-23 the Oxbow and McKean components are well separated by relatively thick and sterile deposits. Moreover this evidence has been recorded in a variety of depositional environments including fluvial deposits at Thundercloud and Long Creek, aeolian deposits at EgNo-23, and colluvial deposits at Cut Arm. These deposits indicate a long period of sediment accumulation between occupations and do not support the gradual development of McKean from Oxbow.

More difficult to dismiss is the development of McKean as a result of diffusion. McKean adaptations tend to be regional in nature especially between northern and southern populations, but local adaptations have also been noted from east to west within the southern portion of the McKean range (Tratebas 1998; Sundstrom 1989). The unifying theme in all of the areas is the identification of diagnostic McKean projectile points, but even within these well-defined types it is possible to note slight changes in style from one area to the next. Given the degree of variability, Keyser and

Davis (1985:130) prefer to interpret the rapid spread of McKean as a result of the "diffusion of a techno-complex through a series of in situ Northwestern Plains populations". It should be noted that much of the evidence that has been used to support a McKean migration could also be used to support diffusion. For instance, the outward expansion of McKean from the Bighorn Basin/Yellowstone Headwaters region (as suggested by radiocarbon dates) may represent the time lag in the adoption of McKean point styles by *in situ* populations. Such a phenomenon may also explain the occurrence of late Oxbow radiocarbon dates on the northern fringe of the Plains since these areas are farthest from the 'core' region and would represent the last groups to adopt these new point forms.

It is also important to note that many of Wright's (1995) arguments for the direct development of McKean from Oxbow are also in support of diffusion. At multi-component sites, both Oxbow and McKean components are often present indicating a similar pattern of habitation and site use. Also, Oxbow components are always located stratigraphically below McKean in sites with good context. More importantly, Oxbow points are occasionally recovered in McKean assemblages (such as at Crown, and Saahkómaapína), but are generally dismissed as being the result of stratigraphic mixing. These points may, in fact, represent a continued connection between local populations.

The argument for diffusion may be further strengthened by an examination of Oxbow and McKean toolkits. Wright (1995:308) provides a direct comparison of the tool assemblages from a number of Oxbow and McKean components from Alberta, Saskatchewan and Manitoba. With the exception of the Harder site assemblage all the components revealed similar coefficients of variability. Furthermore, Oxbow components are often associated with a number of triangular preforms that clearly resemble McKean Lanceolate points. It is possible that they represent a transitional form or the initial adoption of the McKean Lanceolate point type.

It is also possible that there are similarities in burial practices and belief systems between Oxbow and McKean. Wright (1995:324) argues that the inclusion of Oxbow, McKean, and Pelican Lake points in Majorville Cairn indicates, "...an exceptionally stable ceremonial belief system." Furthermore, the presence of McKean points at the Gray burial site would be definite deviation from standard burial practices and may suggest further continuity.

Finally, it is clear that much of the data in support of migration is based on a very small sample size. At present only two McKean burials have been confirmed in the Canadian Plains and the Graham burial is clearly atypical. Also, artifacts identified as grinding stones at the Redtail site are definitely ground, but may have been used for another purpose. Furthermore, future analyses of the Redtail pithouse may strengthen the argument for a McKean migration, but until such time cultural affiliation cannot be determined.

While it is clear that caution must be applied to such a small sample, this research supports the development of McKean by migration rather than diffusion. It is true that Oxbow components are often found in the same sites as McKean, but they are generally well separated by sterile sediments often indicating a long period between subsequent occupations. Also, to my knowledge the direct association of Oxbow and McKean has never been demonstrated in sites with good context. As for similarities between Oxbow and McKean toolkits, it is my firm belief that a comparison of the toolkits between many of the other Plains complexes (Besant, Pelican Lake, etc.) would yield similar results.

With respect to mortuary behaviour, there is continued debate over the identification of McKean Lanceolate points at the Gray burial site (Walker, personal communication 2004) and therefore the data contribute little to the present discussion. As such, the remaining data presented on the continuity of McKean burial styles throughout the Northwestern Plains do not support the transference of a weapon system alone. Furthermore, the identification of several 'southern' McKean traits at the Redtail site provides evidence of further continuity between regions. Combined with the stratigraphic evidence, a rapid diffusion of point styles is no longer supported.

4.4 Summary

Various McKean origin hypotheses have been presented and discussed. Unfortunately, data from McKean sites in the Canadian Plains reveal little about the ultimate origin of McKean. Current radiocarbon evidence indicates that the mountains surrounding the Yellowstone drainage or the Bighorn Basin are the likely homeland for McKean.

People associated with McKean projectile points in the northern portion of the McKean range do not appear to have developed as a result of diffusion or *in situ* development. An examination of the available data in reference to Rouse's (1958) five

criteria seems to support a McKean migration from the 'core area' around 4500 rcybp, although such a determination is clearly limited by the available data. The spread of McKean is undoubtedly related to the development of post-Altithermal climatic conditions, but may also be related to increased population pressure within the 'core region'. The outward expansion of McKean was likely facilitated by the adaptability of the McKean toolkit and a willingness to utilize a wide variety of lithic and faunal resources. At present, the available radiocarbon evidence, continuity in McKean burial patterns, evidence from stratigraphy, and the McKean assemblage recovered from the Redtail site strengthen this interpretation.

Chapter 5

McKean Typology and Taxonomy

5.1 McKean Point Typology

Variation in the types of projectile points associated with the McKean 'complex' continues to pose problems for McKean taxonomy. Some styles, such as Oxbow and Yonkee, were originally thought to represent even greater variation and, while the cultural connections between groups using Oxbow, McKean, and Yonkee points have yet to be resolved, they are now considered to represent separate taxonomic units. At present the McKean Lanceolate, Duncan, and Hanna types (and Mallory in the southern portion of the range) are widely accepted as being representative of McKean. This association is based, in large part, on the interpretations of the assemblage recovered from the McKean type-site. In his investigation of the lower occupation at the McKean site, Mulloy (1954) recovered numerous stemmed and lanceolate projectile points. Mulloy (1954:436-437) noted that the artifacts were recovered from a thick layer of charcoal-stained sand with no evidence of stratification and, as a result, he interpreted the points to represent variation in style among a single point type (Mulloy 1954:445). At the same time Wheeler's (1995, 1996, 1997) excavations in the three reservoir areas revealed components that contained only one of the named variants. In defining the Duncan and Hanna types Wheeler (1954:9) noted that, "These observations suggest that all three points are substantive types and imply some degree of temporal difference among them."

Subsequent archaeological investigations have yielded McKean components in support of both viewpoints (Table 5.1). Numerous components have been recorded that include one, two, or all three of the named variants. Even so, few discussions have attempted to resolve the issue, or have preferred to focus on examining the

Table 5.1. Select McKean Components from the Northern Plains and Associated McKean Projectile Points.

Site Name	Identified McKean Components	McKean	Duncan/ Hanna	Reference
Alberta				
Cranford (DlPb-2)	McKean Activity Area	4	-	Stuart 1990
Majorville (EdPc-1)	Layers 2-16	18	37	Calder 1977
Cactus Flower (EbOp-16)	Occupation III	-	3	Brumley 1975
	Occupation IV	1	3	
	Occupation V	-	1	
	Occupation VI	-	4	
	Occupation VII	-	2	
	Occupation VIII	2	7	
	Occupaiton IX	1	-	
Saahkómaapína (EeOv-68)	Block 4: Occupation 2	-	2	Head et.al. 2003
	Block 4: Occupation 3	-	2	
	Block 3: Occupation 5	3	3	
Saskatchewan				
Billet (EkNv-36)	Test Units	-	4	Ramsay 1993
Big Kill (EbNj-2)	Surface Collection	7	-	Wettlaufer 1951
Crown (FhNa-86)	Hanna Component (3-4 occupaitons)	-	8	Quigg 1986
	McKean Component (3 occupations)	7	-	
Cut Arm (FbNp-22)	Occupation 8	1	-	This Volume
Graham (FaNq-30)	Single Component	-	1	Walker 1984
Long Creek (DgMr-1)	Level 5	-	1	Wettlaufer and Mayer-Oakes 1960
Meewasin (FbNp-9)	Level 4b			This Volume
Mortlach (EcNl-1)	Zone 8	-	2	Wettlaufer 1955
Sjovold (EiNs-4)	Layer XXI	-	1	Dyck and Morlan 1995
Sullivan (EjNr-1)	Surface and Test Units	-	48	Johnson 1975
Redtail (FbNp-10)	Occupation 11	-	1	Ramsay 1993
	Occupation 12 (1 and 2)	-	6	
	Occupation 13 (2)	1	1?	
	Occupation 13 (4)	2	-	
Thundercloud (FbNp-25)	Occupation 5a	-	2	This Volume
	Occupation 5b	-	3	
	Occupation 5c	3	-	
Unnamed (EgNo-23)	Occupation 2a	-	2	This Volume
	Occupation 2b	-	1	
	Occupation 3	1	-	
	Disturbed Bone Bed	2	-	
Manitoba				
Tailrace Bay (GRS-3)	Gravel Zone (lowest occupation)	11	1?	Syms 1969
North Dakota				
Mondrian Tree (32MZ58)	Area A: Zone 7	-	1	Toom 1983
Red Fox (32BO213)	Level 4 (four occupations)	-	16	Keyser 1985
South Dakota				
Beaver Creek (39CU779)	Unit 11	1?	-	Martin et.al. 1993
	Unit 13	1	-	
	Unit 14 (top)	1?	-	
Gant (39ME9)	Single Component	13	10	Gant & Hurt, Jr.1965;Davis & Keyser 1999
Harney (39FA10)	Component A	1	-	Wheeler 1995
	Component B	1	1	
	Component C	1	1	
Kolterman (39FA68)	Component B	3	-	Wheeler 1995
Lightning Spring (39HN204)	Stratum 8	-	4	Keyser and Davis 1984;
	Stratum 9	-	1	Keyser and Wettstaed 1995
	Stratum 10	-	1?	
	Stratum 11	-	6	
	Stratum 12	-	1	
	Stratum 13	-	1	
	Stratum 14	-	1	

Table 5.1. Select McKean Components from the Northern Plains and Associated McKean Projectile Points (Continued).

Site Name	Identified McKean Components	McKean	Duncan/ Hanna	Reference
Montana				
Benson's Butte (24BH1726)	Layer I and II	22	33	Fredlund 1979
Carbella (24PA302)	Single Component	1	23	Arthur 1966; Davis and Keyser 1999
Dodge (24RB225)	Collection area	-	4	Davis 1976
Quinn Creek (24JF110)	CMU 5,17,18	-	10	Rennie and Hughes 1998
Unnamed (24RB1164)	McKean compenent	-	17	Munson 1992
Wyoming				
Belle Rockshelter	Component B Component C	- 7	1 -	Wheeler 1996
Cordero (48CA75)	Middle Plains Archaic activity floor	-	7	Reher et.al. 1985
Dead Indian Creek (48PA551)	Single Component	86	54	Frison & Walker 1984; Davis & Keyser 1999
Leigh Cave (48WA304)	Single Occupation	-	6	Frison and Huseas 1968
McKean (48CK7)	Lower Component	36	48	Mulloy 1954; Davis and Keyser 1999
Mule Creek (48CK204)	Component C Component D	- 12	1 2	Wheeler 1996
Mummy Cave (48PA201)	Level 30	36	61	Husted & Edgar 2002; Davis & Keyser 1999
Scoggin (48CR304)	Single Component	18	-	Lobdell 1973
Colorado				
Dipper Gap (5LG101)	Level D	1?	80	Metcalf 1974; Morris et.al. 1985

co-occurrence rather than the separation of these types. For instance, Syms (1970) suggested that each of the variants may represent closely related but distinct ethnic groups. Husted (1991, 1995) suggests a separate but coeval evolution of the stemmed and lanceolate varieties from people who had developed from the same linguistic stock. Davis and Keyser (1999) prefer a functional approach, suggesting that McKean Lanceolate points may have functioned as spear points while Duncan and Hanna points are interpreted as atlatl dart points. In all cases, such interpretations indicate a co-existence of types and do not explore the possibility of stratigraphic or temporal separation between any of these styles.

The analysis of projectile points by Davis and Keyser (1999) raises another issue that factors heavily in the association of the McKean point variants. There is a considerable amount of confusion associated with the identification of the Duncan and Hanna projectile points, largely as a result of the original definition by Wheeler in 1954. Wheeler (1954:7-8) provides the following characteristics to separate the two types:

> The Duncan point is a chipped stone projectile point characterized by a straight converging or bilaterally convex blade; insloping, non-barbed shoulders; and a straight parallel-sided or slightly expanding stem with a shallowly notched base.

> The Hanna point is a chipped stone projectile point characterized by a straight converging and incurving blade; straight or insloping and slightly barbed shoulders; and an expanding stem with shallowly notched or straight, thinned base.

The primary difference between these definitions is the presence or absence of slightly barbed shoulders, an expanded stem (although Wheeler allows for a slightly expanding stem for Duncan), and a concave or straight base. In a detailed analysis of the technological attributes of the point styles associated with McKean, Davis and Keyser (1999:266) conclude that the, "...Duncan and Hanna types are in fact a single projectile point form whose morphological differences are due to resharpening and refurbishment." Indeed, this author can attest to occasional difficulties in identifying some stemmed point variants and has observed instances where points identified as Duncan (Brumley 1975:Plate 15 h) are nearly identical to points identified as Hanna (Brumley 1975:Plate 15 p). Moreover, radiocarbon dates associated with Duncan and Hanna projectile points completely overlap and both styles are often associated in sites with good stratigraphic context (see Appendix C; Table C.5). Some caution should be applied, however, because Keyser and Davis (1999) fail to address the issue of the presence of a straight base in Hanna points alone. For instance, points identified as Duncan in Saskatchewan always exhibit a slight basal concavity, while there are numerous examples of straight-based Hanna points (see Chapter 2). Preliminary examination of the radiocarbon dates and stratigraphy associated with these straight-based forms seems to indicate that they may represent a late variant of the Hanna style, but unfortunately the sample is too small to confirm this hypothesis. In light of these problems and the technological analysis by Keyser and Davis (1999) Duncan and Hanna points are considered here, in the very least, as variations of the same type (Duncan-Hanna) and are compared to the separate and distinguishable McKean Lanceolate form.

5.2 Stratigraphy

A number of important multi-component McKean assemblages have been excavated since 1954 allowing for a re-examination of the stratigraphic relationship between the point styles identified as McKean (see Table 5.1). Of primary concern to this discussion are sites that have yielded a combination of both the McKean Lanceolate and Duncan-Hanna types.

Some examples include Majorville Cairn, Saahkómaapína, and Cactus Flower in Alberta; Benson's Butte in Montana; Gant in South Dakota; and Dead Indian Creek, Mummy Cave, and McKean in Wyoming (Brumley 1975; Head et.al. 2003; Calder 1977; Fredlund 1979; Gant and Hurt, Jr. 1965; Frison and Walker 1984; Husted and Edgar 2002; Mulloy 1954). A quick survey of Table 5.1 reveals that McKean Lanceolate points are rarely associated with Duncan-Hanna points in the Canadian Plains. Exceptions are noted above and at present the largest sample of associated points was recovered from Majorville Cairn in Alberta. Problems with the stratigraphy of this site were discussed in Chapter 2 and it is clear that much of the original provenience has been lost. Projectile points recovered from occupation 5 of Block 3 at Saahkómaapína included a possible Oxbow point, three McKean Lanceolate points, three Duncan-Hanna points, and a Pelican Lake point. Researchers indicate that the assemblage appears to represent a mixture of artifacts from occupations 4,5, and 6 (Head et.al. 2003:22) and the direct association of all point types is not warranted. Perhaps the best evidence for the association of McKean and Duncan-Hanna in the Canadian Plains comes from the Cactus Flower site. In particular, occupation VIII revealed two McKean Lanceolate points in association with seven Duncan-Hanna points. Brumley (1975) does not identify evidence of stratigraphic mixing at Cactus Flower and an examination of the stratigraphy (see Brumley 1975:136,153) reveals a well-developed profile with little evidence of disturbance. Brumley (1975: 32-34) did, however, record a number of features in level 8 including three basin-shaped hearths and an excavated pit that was up to 60 centimeters in depth. The original excavation of these features, by the site occupants, would have cut into the earlier McKean occupation (layer IX) which is located as little as 20 centimeters below the Occupation VIII living floor. Such activities could easily account for the recovery of all three of the point varieties, but an actual association of materials should not be ruled out.

Assemblages containing both the stemmed and lanceolate McKean variants are more common in the United States. For example, a large assemblage of McKean points was recovered from Benson's Butte in southern Montana (Fredlund 1979). A number of projectile points (ranging from Paleoindian to Late Archaic) were recovered during excavation. McKean points were concentrated in Level I along with points identified as Frederick, Eden and Agate Basin (Fredlund 1979:54-57). It appears that the sediments at Benson's Butte have accumulated as a result of slope wash and

erosion and, combined with evidence for activity by treasure seekers, much of the assemblage appears to be mixed.

The Gant site in southwestern South Dakota may represent a true association of points in the McKean complex. Researchers at the site encountered a single occupation layer that was no greater than 6 inches (approximately 15 centimeters) in thickness and stratified sediments were not identified in the occupation level (Gant and Hurt, Jr. 1965:21). Nevertheless, Gant and Hurt (1965:21) note the recovery of, "...a series of overlapping and superimposed shallow basin-shaped firepits." Such evidence is suggestive of multiple occupations, but in the absence of radiocarbon dates the amount of time between subsequent occupations remains unclear.

At present, archaeological sites in Wyoming have yielded a number of large projectile point assemblages that hint at the co-occurrence of point styles in the McKean complex. The largest assemblage (in terms of numbers of projectile points) was recovered from Dead Indian Creek in northwestern Wyoming (Frison and Walker 1984). Stratigraphic layering was not evident during excavation and all artifacts are believed to represent a single component (Walker and Frison 1984:112). Identified projectile points include McKean Lanceolate, Duncan-Hanna, and a large number of side-notched varieties that are not associated with McKean (see Simpson et.al. 1984:23; Figure 8). While there was no evidence of stratigraphic layering, the artifacts were distributed in a wide deposit measuring up to 90 centimeters in depth (Frison and Walker 1984:12). The mixture of projectile point styles and the overall thickness of the artifact bearing deposit are interpreted here to indicate the presence of multiple occupations in the Dead Indian sequence.

Layer 30 of Mummy Cave also yielded a large number of McKean and Duncan-Hanna points as well as 11 "eared" points that appear similar to Oxbow (Husted and Edgar 2002). Four radiocarbon samples were submitted from Layer 30 and the resulting dates range from 4420±150 rcybp (I-1428; Husted 1995) to 4090±140 rcybp (I-1580; Husted and Edgar 2002). Furthermore, during excavation two occupations were noted to merge together and, "...portions of the lower part of Culture Layer 30 were excavated as Layer 28..." (Husted and Edgar 2002:60). In the case of Mummy Cave a combination of stratigraphy, additional projectile point styles, and variable radiocarbon dates support the inclusion of more than one occupation in the Layer 30 assemblage.

The final site in this discussion is perhaps also the most important. It was, in large part, the stratigraphic association of projectile points at the McKean type-site that led to the development of the "McKean complex" (Mulloy 1954). Mulloy (1954:440) recorded two occupations at the site, an upper and a lower, which were well separated in the stratigraphy and did not appear to have been mixed. The lower occupation revealed numerous McKean Lanceolate, Duncan and Hanna projectile points in association with a variety of artifacts and features. The importance of the type-site cannot be understated and to my knowledge the assemblage from the McKean site remains the only one to exhibit nearly all of the cultural traits considered to be representative of McKean (such as burials, manos and metates, seeds, slab-lined pits, a pit house, and all of the typical McKean projectile points). Even so, a reanalysis of the site indicates that some of Mulloy's (1954) assumptions are in error. For instance, Kornfeld (1995a:306) argues against Mulloy's (1954) distinct separation between the upper and lower layers noting that, "In every excavation, including areas next to the original excavation at Locality II (Block 1), we encountered a continuous deposition of archaeological material... Nowhere were two separate archaeological strata discernable." Furthermore, the researchers noted that McKean Lanceolate points were located towards the bottom of the lower occupation and stemmed varieties occurred near the top (Kornfeld 1995a). Based on this information Kornfeld (1995b:316) concludes that:

> Our brief reinvestigation of Belle Shelter, review of Mule Creek Shelter notes, and extensive reinvestigation of the McKean site indicates that the debate relied on faulty or false data. The excavation of Block 1 at the McKean site strongly suggests that stratigraphic separation exists between McKean lanceolate, Duncan, and Hanna projectile points.

It is obvious from this discussion that many of the large McKean assemblages have suffered some form of mixing or lack of stratification that has led to difficulties in separating individual point types. At sites such as Majorville Cairn, Benson's Butte, Mummy Cave, and McKean problems with stratigraphy have been identified, however, an alternate explanation is required for sites that lack evidence of mixing. A possible explanation may be related to the climatic conditions associated with McKean. Widespread landscape stabilization following the Altithermal would have decreased deposition in some areas leading to a compaction of many archaeological sequences. For instance, Boyd's (2000:39) evaluation of Pre-contact landscapes in southwestern

Manitoba indicates that, "By the end of the middle Holocene (c. 4,100-3,300 BP), a period of greater landscape stability was initiated in the south-central Hind basin." Evidence of this stability has been uncovered in the stratigraphic records at both Thundercloud and EgNo-23.

The Thundercloud site is located on a point bar surrounded by a small ephemeral stream. An examination of the site sediments indicated that the stream was close to its current position by 4500 rcybp. Excavation units placed 20 to 30 metres from the stream margin revealed evidence of three archaeological components in relatively thick (15 to 20 centimeters) paleosols. Units placed closer to the stream (10 meters from the stream margin) revealed a complex stratigraphic profile and a separation of the three components into at least 11 cultural occupations (Webster 1999). The resulting interpretations changed dramatically during the course of the investigation. Initially, all of the McKean materials were recovered in one component and were analyzed as a single related unit. Later separation of the occupations required a re-evaluation and the recognition of separate and distinct McKean and Duncan-Hanna occupations. Without the increased deposition due to overbank flooding in units closer to the creek, such fine-scale observations would not have been possible and the Thundercloud site would be considered a single McKean component containing all three of the projectile point variants.

Similar observations were recorded at EgNo-23 (see Appendix A, Figure A.8) where the highest portions of the stabilized sand dune received far less deposition than the lower depressions. Cultural material located near the apex of the dune was recovered from a single, dark soil horizon with little or no evidence of stratigraphic separation. Artifacts deposited closer to the base of the dune were separated into distinct occupations by thin lenses of aeolian deposited sand. Again, without having excavated a large linear area it would have been difficult, if not impossible, to separate the McKean Lanceolate and later Duncan-Hanna occupations.

These sites indicate the importance of environmental and topographic reconstruction in archaeology and, more importantly, provide a possible explanation for the perceived association of point styles in some McKean components.

5.3 Data From Radiocarbon Dates

As mentioned previously, the McKean radiocarbon database has increased steadily in the past several decades. This is especially true in Saskatchewan where, in the last 11 years, components from six sites have produced 20 new dates. In fact, with

the exception of two radiocarbon dates (Mortlach: S-2 and Long Creek: S-63a) all of the samples associated with McKean components in Saskatchewan were submitted after 1980. Consequently, many of these samples were processed using more accurate methods of analysis, thereby increasing the reliability of the results (Morlan 1993). Furthermore, many of the resulting dates have small standard deviations (even at 2-sigma) allowing for much tighter control of the McKean chronology in this area. Lastly, the author has been involved in the collection of many of these new samples or has personally examined the field notes associated with a majority of the remaining sites and, as a result, this discussion will begin by taking a more regional approach in defining the McKean chronology for southern Saskatchewan.

A total of 36 McKean radiocarbon dates have been obtained from sites in southern Saskatchewan (Table 5.2). Samples represent as many as 25 occupations from 10 different sites of which five contain single McKean occupations and the remainder are multi-component. All but one of the dates (S-2519) is associated with a diagnostic projectile point and, more surprisingly, 32 of these are associated with either the McKean Lanceolate or the Duncan-Hanna types. Such a dramatic separation between the dominant point styles of the McKean complex is relatively unique in the Northern Plains and allows for an examination of the potential for a temporal separation of these artifacts.

Figure 5.1 plots the available radiocarbon dates using two standard deviations. Associated projectile points are also included and are represented by symbols at the mid-point of each date. Interestingly, the earliest dates are all associated with McKean Lanceolate projectile points. These samples were obtained from four sites (Redtail, Thundercloud, EgNo-23, and Crown) and represent no fewer than seven cultural occupations. Three of the dates are questionable, including two from Redtail and one from the Crown site. The dates from Redtail are from Occupation Level 13 (2) and are associated with a McKean point and possibly a Duncan point. A close examination of the stratigraphy indicates that the Duncan point should be included with the assemblage from occupation 13 (1). Consequently, it seems likely that Level 13 (2) is only associated with McKean Lanceolate points. The third questionable date was obtained from Level 7 West at the Crown site (Quigg 1986). Diagnostic artifacts were not recovered from this level, however, the stratigraphic position of the occupation and the close association with Level 8 West (a McKean Lanceolate occupation) provides the basis to suggest the presence of another link to the McKean Lanceolate type.

Table 5.2. McKean Radiocarbon Dates From Saskatchewan.

Site Name	Lab Number	Sample	Calc. Age (B.P.)	Norm. Age (B.P.)	Associated Points	Source
Billet (EkNv-36)	S-2063	Charcoal	3470±120	3470±120	Hanna	Dyck 1983
	S-2054	Bone	3100±60	3180±60	Hanna	
Cut Arm (FbNp-22)	BGS-2383	Bone	3387±50	3441±50	McKean	New Date
	BGS-2384	Bone	3448±60	3520±60	McKean	New Date
Crown (FhNa-86)	S-2556	Bone	3605±120	3685±120	Hanna/Oxbow?	Quigg 1986
	S-2292	Bone	3310±110	3410±110	Hanna	
	S-2291	Bone	3425±105	3505±105	Hanna	
	S-2554	Bone	3600±80	3680±80	Hanna	
	S-2519	Charcoal	3965±95	3965±95	No diagnostics	
	S-2526	Bone	3995±95	4075±80	McKean	
	S-2369	Bone	3825±90	3905±90	McKean	
	S-2290	Bone	4180±115	4260±115	McKean	
	S-2520	Bone	4330±115	4410±115	McKean	
	S-2521	Bone	3825±75	3905±80	McKean	
	S-2525	Bone	4295±85	4375±85	McKean	
Graham (FaNq-30)	S-1574	Bone	3245±50	3350±55	Duncan	Walker 1984
Long Creek (DgMr-1)	S-63a	Charcoal	3370±145	3370±145	Hanna	Wettlaufer&Meyer-Oakes 1960
	BGS-2362	Bone	3775±55	3856±55	Hanna	New Date
Mortlach (EcNl-1)	S-2	Bone	3400±200	3480±200	Duncan	Wettlaufer 1956
Redtail (FbNp-10)	S-3372	Bone	3480±80	3580±80	Hanna	Ramsay 1993
	S-3373	Bone	3470±80	3570±80	Hanna	
	S-3008	Bone	3660±75	3740±80	Hanna	
	S-3374	Bone	3860±70	3965±70	McKean/Duncan?	
	S-3375	Bone	3880±70	3980±70	McKean/Duncan?	
	S-3009	Bone	4280±80	4360±80	McKean	
Sjovold (EiNs-4)	S-2062	Bone	3530±115	3610±115	Hanna	Dyck and Morlan 1995
Thundercloud(FbNp-25)	BGS-2369	Bone	3150±50	3172±50	Duncan/Hanna	New Date
	NZA-15749	Bone	Unknown	3382±55 (AMS)	Duncan/Hanna	Leyden 2004
	BGS-2367	Bone	3315±50	3375±50	Duncan/Hanna	New Date
	S-3645	Bone	4040±90	4145±90	McKean	Webster 1999
Un-named (EgNo-23)	BGS-2363	Bone	3348±50	3427±50	Hanna	New Date
	Beta-167310	Bone	3430±40	3520±40	Hanna	New Date
	BGS-2364	Bone	3440±55	3537±55	Hanna	New Date
	BGS-2366	Bone	3540±50	3620±50	McKean	New Date
	BGS-2386	Bone	3530±50	3613±50	McKean	New Date
	Beta-183521	Bone	4140±60	4240±60	McKean	New Date

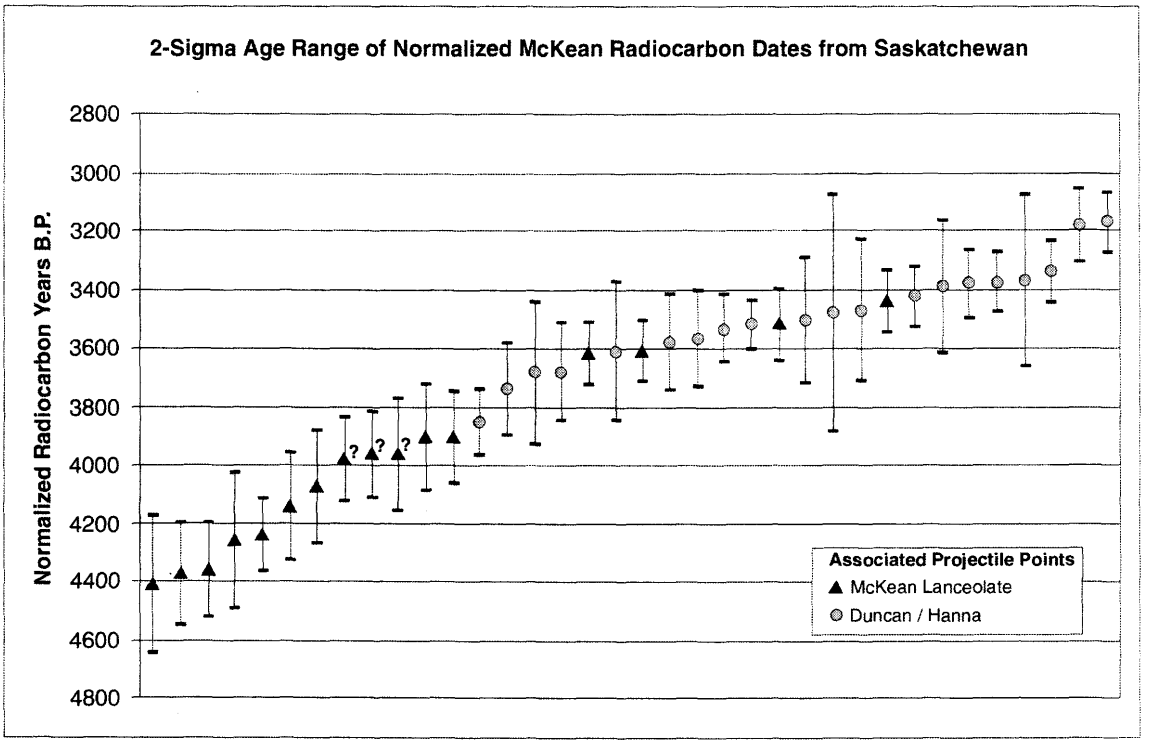

Figure 5.1. Normalized McKean Radiocarbon Dates from Saskatchewan Using Two Standard Deviations and Associated Diagnostic Projectile Points.

The results of Figure 5.1 are dramatic and indicate an earlier appearance of McKean Lanceolate points for areas in southern Saskatchewan. The McKean Lanceolate type first appears in the archaeological record at approximately 4400 rcybp as evidenced by dates from Crown and Redtail. The sequence also indicates a persistence of the McKean Lanceolate style until as late as 3400 rcybp although a decline in use is suggested after 3900 rcybp with the first appearance of Duncan-Hanna projectile points. Given the present data, the transition from McKean Lanceolate to Duncan-Hanna appears to have been gradual in Saskatchewan with approximately 500 years of overlap in the use of both lanceolate and stemmed varieties. Duncan-Hanna projectile points clearly dominate McKean assemblages dated after 3900 rcybp and also show a continuous pattern of use until approximately 3200 rcybp and the eventual replacement of McKean by the Pelican Lake complex.

Interestingly, this early occurrence of McKean Lanceolate points is mirrored throughout the Northern Plains (Figure 5.2). If we ignore, for the moment, assemblages that have yielded both McKean Lanceolate and Duncan-Hanna points and focus on occupations that contain only one of these types it is clear that the McKean Lanceolate type is the older of the two.

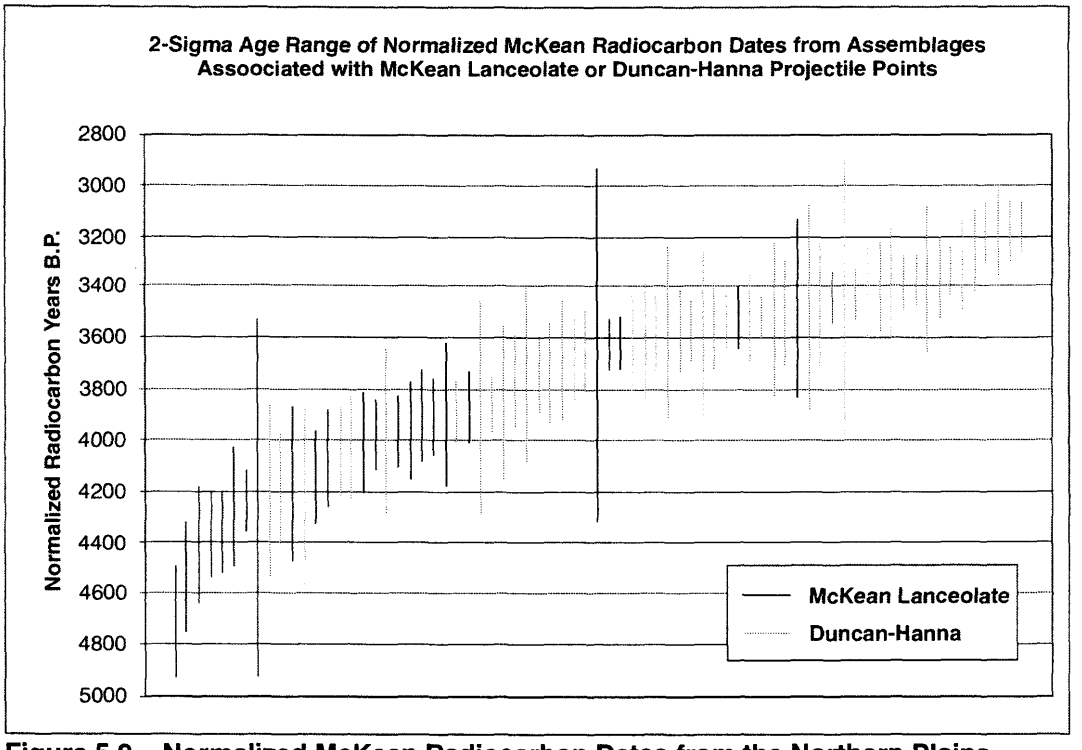

Figure 5.2. Normalized McKean Radiocarbon Dates from the Northern Plains Using Two Standard Deviations and Associated Diagnostic Projectile Points.

Using approximately 3900 rcybp as a dividing line (as noted in the Saskatchewan radiocarbon dates) 19 of the 25 recorded McKean Lanceolate dates fall below this line. Conversely, 41 of 48 Duncan-Hanna radiocarbon dates are, on average, more recent than 3900 rcybp. Furthermore, there is as much as a 500-year gap between the first appearance of McKean and the earliest Duncan-Hanna date, as well as a similar gap between the final appearance of McKean at 3440 B.P. and the eventual decline in the use of Duncan-Hanna points by 3170 B.P. Such data argue strongly for a temporal separation of these types, but also supports a long period of potential interaction between groups using these different projectile point styles or the use of both types by members of the same group.

5.4 Discussion

The data from stratigraphy and radiocarbon dates do not provide insight into the relationships of the cultural groups who utilized McKean Lanceolate and Duncan-Hanna projectile points, nor is the intent to suggest that these styles are un-related. On the contrary, similarities between McKean Lanceolate and Duncan-Hanna assemblages play a major role in the difficulty in separating the two types and hints at a direct cultural connection. What is apparent is that people using McKean Lanceolate projectile points migrated to Saskatchewan from the northern United States by approximately 4400 B.P. Furthermore, evidence of more 'southern' McKean traits at the Redtail site as well as the recovery of exotic lithic materials from Montana and North Dakota in McKean components from Saskatchewan may indicate a continued cultural link to these areas. Such links could have facilitated the transference of the Duncan-Hanna point type which, like the McKean Lanceolate type, appears earlier in the northern States. Diffusion, rather than migration, of the Duncan-Hanna type is indicated by cultural continuity between McKean Lanceolate and Duncan-Hanna components. For example, with the exception of different point types, the assemblages from Redtail, Thundercloud, EgNo-23, Cactus Flower, and Saahkómaapína are nearly identical from one occupation to the next leading to similar interpretations of subsistence and settlement patterns. A similar situation exists for McKean components in the United States although the transition from McKean Lanceolate to Duncan-Hanna may have taken considerably longer (perhaps as much as 800 years) leading to the increased potential for assemblages with both projectile points types in this region. Whether these represent a single cultural group using variable projectile point styles or the interaction of different 'ethnic groups' within a larger cultural continuum remains to be seen.

At present, the data from radiocarbon dates and stratigraphy reveal major differences in the interpretation of McKean in the northern and southern portions of the McKean range. In the Canadian Plains, McKean Lanceolate points are rarely found in association with Duncan-Hanna points and in multi-component sites they are generally well separated into distinct occupations. The same cannot be said for many sites in southern Montana, Wyoming and South Dakota where the lanceolate and stemmed types are more commonly found in the same occupation. While it has been shown that stratigraphic mixing has occurred at a number of these sites, this does not preclude the possibility that the McKean Lanceolate and Duncan-Hanna points were truly

associated. The situation leads to difficulties in creating a taxonomic system for McKean that works for the entire Northern Plains area.

While several researchers (Keyser and Davis 1985; Kornfeld 1995a; Ramsay 1993; Webster 1999) have noted the potential separation of the McKean and Duncan-Hanna types, most continue to follow the original taxonomy provided by Mulloy (1954) in referring to McKean as a complex. Even so, a variety of taxonomic terms have been suggested including tradition (Ramsay 1993; Stallcop 1966), horizon (Syms 1969), and series (Dyck and Morlan 2001). As such, it is important to look at the definitions of each of these terms and how they best reflect the data presented herein (Table 5.3).

Based on these definitions, the defining characteristic of a complex is an overall similarity between related archaeological assemblages and their placement in a relatively narrow temporal sequence. While it is true that the assemblages bearing McKean Lanceolate and Duncan-Hanna projectile points are very similar, the temporal separation of these types can no longer support such a taxonomic designation.

In keeping with the concept of an horizon, the spread of McKean does appear to cover a large geographic area over a relatively short time period, however, such a pattern is not evident in the mountains and foothills of Wyoming where there is a well-developed sequence of McKean with, what appears to be, considerable time depth.

In the Canadian Plains McKean seems to fit well with the overall definition of a tradition, but such a designation leads to problems in identifying McKean at lower levels of taxonomy. For instance, in the definitions provided in Table 5.3 a tradition may be comprised of a number of associated complexes (Dyck 1983) or phases (Reeves 1983b). At present, McKean Lanceolate and Duncan-Hanna assemblages cannot be separated into distinct complexes given the overall similarities (other than projectile point style) between these entities. Nor do assemblages bearing these types currently fit into the original definition of a phase, which indicates a restricted geographical limit for the traits in each area:

> A phase is an archaeological unit possessing traits sufficiently characteristic to distinguish it from all other units similarly conceived, whether of the same or other cultures or civilizations, spatially limited to the order of magnitude of a locality or region and chronologically limited to a relatively brief interval of time (Willey and Phillips 1958:22).

Table 5.3. Definitions of Some Taxonomic Terms Associated with McKean.

Taxonomic Designation	Definition
Complex	A complex is a large composite archaeological unit. It consists of Interconnected sites, features, and artifacts, tied together by similarities in function, style, technology, and subsistence-settlement system. The parts of a complex are found within a common geographical distribution and within a common segment of time (Dyck 1983:69). A complex is the total expression of a number of assemblages left by the same group over a sufficiently narrow time period that cultural expressions undergo minor changes (Syms 1977:70-71). ...recurring similarities in cultural material or intra-site spatial organization that can be placed within defined temporal parameters (Rennie and Hughes 1998:9).
Tradition	...an archaeological tradition is a (primarily) temporal continuity represented by persistent configurations in single technologies or other systems of related forms (Willey and Phillips 1958:22). A tradition is defined as persistent configurations in cultural systems which link phases through time. The cultural tradition thus represents continuity in a variety of cultural expressions – artifacts, technology, settlement, subsistence, etc (Reeves 1983b:40). A tradition is an element of a complex (or a group of elements), often diagnostic, which occurs in sequential complexes, passed down as it were from one to the other (Dyck 1983:69).
Horizon	...a primarily spatial continuity represented by cultural traits and assemblages whose nature and mode of occurrence permit the assumption of a broad and rapid spread (Willey and Phillips 1958:33). A horizon is a primarily spatial continuity of certain types, modes, or assemblages that appear to indicate a broad and rapid dispersal (Syms 1969:13).
Series	A series is a sequence of archaeological components sharing a common geographical space (sometimes within a single site, sometimes within a region), but belonging within separate segments of time. A series is a crude unit of archaeological analysis used for convenience before sites, features, and artifacts are ready for reclassification into complexes and traditions (Dyck 1983:69).

Future analyses, especially in multi-component sites, may serve to identify differences between earlier and later McKean occupations, but unfortunately the present database is too small for such regional comparisons to be made. Until such time, this author believes that McKean is better referred to as a series. Based on the definition, series is meant to be used as an arbitrary term until such time that sufficient evidence is available to distinguish the individual components as separate complexes or related elements within a larger tradition. At present, data from the Canadian Plains support the development of McKean as a long-standing archaeological tradition, but the lack of comparisons between stemmed and lanceolate McKean assemblages limits such a determination. Combined with the more complex sequence of McKean components in the United States it seems impossible, at the moment, to clearly define McKean beyond its spatial and temporal borders. It is clear that both McKean Lanceolate and Duncan-Hanna projectile points have a similar geographic distribution and there appears to be a cultural link between the two types. Moreover, it has been argued that these types are temporally distinct (especially in the Canadian Plains) leading to the use, in this volume, of the term 'McKean series' rather than the more commonly used 'McKean complex'.

5.5 Summary

The direct association of McKean Lanceolate and Duncan-Hanna projectile points is difficult to support when provided with new data from McKean components in the Canadian Plains. In combination with the new data, a re-evaluation of McKean components throughout the Northern Plains indicates that in the majority of multi-component McKean sites, McKean Lanceolate projectile points are located in the lower occupations. Furthermore, to my knowledge a 'pure' McKean Lanceolate occupation has never been recorded above a 'pure' Duncan-Hanna occupation, while the opposite is commonplace at many sites.

An analysis of McKean radiocarbon dates from the province of Saskatchewan reinforces the stratigraphic data and suggests a temporal separation of the McKean types. In Saskatchewan, McKean Lanceolate components date from approximately 4400 to 3400 rcybp overlapping with Duncan-Hanna components from 3900 to 3200 rcybp. A similar temporal span is suggested by radiocarbon dates from 'pure' components located throughout the Northern Plains.

Given the apparent stratigraphic and temporal separation of the McKean Lanceolate and Duncan-Hanna projectile point types, the inclusion of all of the variants within a single complex is no longer warranted. Still, the relatively small sample size of McKean sites in some areas combined with the possibility of stratigraphic mixing in many assemblages leads to difficulties in defining the differences between these components. Faced with such ambiguity, McKean is better described as a series until such time that distinct cultural traits, if they do indeed exist, can be recorded and defined.

Chapter 6

Summary and Conclusions

6.1 Summary

This research was born out of the need to update the McKean record in the Canadian Plains. The excavation and analysis of a number of large multi-component sites such as Redtail, Thundercloud, Saahkómaapína, and EgNo-23 has led to the identification of as many as 17 new McKean occupations. As a result, the number of well-documented McKean sites in Saskatchewan is second only to the large number of reported components from the State of Wyoming. By compiling and examining these data it was hoped that this research could fulfill the following objectives:

1. To compile and summarize new and existing McKean data from the Canadian Plains.

2. To compare this data to information from surrounding areas to gain a better understanding of:
    a. McKean Subsistence and Settlement Patterns;
    b. McKean origins; and
    c. McKean Taxonomy (as it relates to Typology).

3. To summarize new radiocarbon dates and re-assess existing dates in an effort to:
    a. Refine the McKean chronology in Saskatchewan.
    b. Assess the possibility of a temporal separation between the various projectile point styles within the McKean series.

4. To examine the apparent differences between northern and southern McKean populations and to outline any similarities in an attempt to assess the relationship between these regions.

5. To outline potential areas for future research with regard to McKean and other Middle Period cultures.

The first objective has been accomplished by the presentation of data in chapter 2. The lengthy summaries from EgNo-23, Redtail, and Thundercloud were necessitated by the fact that data from these sites have yet to be published. This volume currently serves as the primary site report for EgNo-23 and previous reports of the data from the Thundercloud and Redtail sites are restricted to a number of Master's theses at the University of Saskatchewan. By including these lengthy discussions it is hoped that such data will become more widely available to the archaeological community. It is also important to note that there are several McKean components that were not summarized by this work. For instance, a number of Manitoba sites were not included as they exhibit clear evidence of stratigraphic mixing or are poorly documented. Similarly, there is a large body of literature associated with government reports and cultural resource management that have yet to be examined, especially with respect to the Provinces of Alberta and Manitoba. Even so, this author believes that a large majority of the significant McKean components have been compiled herein.

The compilation and analysis of such data has allowed for a number of observations related to the remaining objectives. With regard to subsistence, some of the new data do not support the long-standing belief that McKean populations in the Canadian Plains had developed a total reliance on bison, abandoning the foraging strategy more typical in the 'core' region. Most McKean sites in the Canadian Plains are associated with a relatively small number of bison and do not indicate a heavy reliance on this species. Moreover, the utilization of bison and other large artiodactyls is common in McKean sites located throughout the Northern Plains and should no longer be considered a Canadian phenomenon. The recovery of a number of seeds and small animals in hearth samples from the Redtail and Thundercloud sites also supports the continued use of a diverse subsistence strategy in all areas of the Northern Plains. Broad-based strategies do appear to be more important in areas immediately adjacent to the grasslands as evidenced by the assemblages in sites from the Boreal Forest, foothills, mountains, and large river valleys. Tributaries and terraces of major river systems appear to be particularly important, allowing access to a high diversity of plants and animal species. The lack of such data, at some sites, appears to be clearly related to the sampling strategies employed during excavation. In particular, the lack of fine-screening and flotation analysis may have dramatically altered the interpretations at these sites.

In terms of settlement patterns, many of the McKean occupations in the Canadian Plains appear to have been occupied in the warmer months of the year (spring to fall) and are generally represented by short-term campsites. Sites are clustered around the Saskatchewan River and its tributaries. Multi-component sites show a long history of re-occupation and are generally within viewing distance of the main river channel. Such evidence appears to support the view that people of the McKean series had a well-developed seasonal round that relies heavily on the availability of local resources. These campsites are often located in diverse ecosystems that support a number of seasonally available plant and animal species. The lack of winter campsites is enigmatic, but may be related to problems determining the season of occupation at some sites.

Evidence for the use of structures by McKean is limited in the Canadian Plains. Pithouses have been identified in McKean assemblages from Wyoming and South Dakota, but have yet to be confirmed in Canada. A Middle Precontact-aged pithouse from the Redtail site may be related to McKean, but researchers did not encounter diagnostic artifacts during excavation. Tent-like structures may have been used by people of the McKean series as evidenced by artifact and feature patterns recorded at Cactus Flower, Redtail, Saahkómaapína, and EgNo-23. These patterns are typically circular in shape and between three to five meters in diameter. Whether this is evidence of an actual structure or simply a well-defined activity area remains unknown, however, such areas appear to indicate the presence of small groups, perhaps even individual family units.

A re-analysis of the available McKean series radiocarbon dates supports researchers who identify the Bighorn Basin and Yellowstone headwaters as the likely homeland of McKean. With respect to the expansion of McKean into the Canadian Plains, there appears to be a definite time lag (of approximately 500 years) between the first appearance of McKean in the 'core' area and the first record of McKean in Canada. The sequence indicates a rapid spread of McKean from areas in Wyoming and Montana shortly after the initial development and, once established in outlying areas, McKean persisted until the eventual disappearance at approximately 3100 rcybp. An actual migration of people is supported over diffusion or *in situ* development by the consistency in projectile point styles and mortuary behaviour throughout the Northern Plains. Limited evidence from the identification of exotic lithic materials also hints at continued connections or reverse migrations to the source areas in Montana

and North Dakota. Reasons for such a migration are unknown, but are undoubtedly linked to the amelioration of Altithermal climatic conditions. The large number of McKean sites within the 'core' area may also suggest increased population pressure and the need to expand the subsistence base.

With respect to the McKean chronology in Saskatchewan, this research alone has added 11 new radiocarbon dates to the database. In combination with the dates from Redtail, Sjovold, and Crown it is now possible to reconstruct a more accurate time-line for the use of the various projectile points in the McKean series. The data indicate that the McKean Lanceolate point type is the oldest of the McKean variants with a temporal range from 4400 to 3400 rcybp, overlapping slightly with the Duncan and Hanna types with a range of 3900 to 3200 rcybp. Furthermore, there appears to be a dramatic decrease in the use of the McKean Lanceolate type after 3900 rcybp. This pattern is mirrored by an examination of all of the available McKean series radiocarbon dates and such evidence supports a temporal separation of the lanceolate and stemmed point varieties. More importantly, an examination of the stratigraphy at a number of multi-component sites indicates that McKean Lanceolate points are always located below the stemmed varieties in sites with good archaeological context. At present, a 'pure' McKean Lanceolate component has yet to be recorded above a Duncan or Hanna assemblage, while evidence of the reverse situation is becoming more commonplace throughout the Northern Plains.

Unlike the temporal separation of the lanceolate and stemmed types, there appears to be little separation in the use of the Duncan and Hanna point variants. Both styles appear to have a similar distribution and were in use during the same period of time. They may indeed, as has been suggested, represent different stages of use and reshaping of the same point type (Davis and Keyser 1999). In some instances it is indeed difficult to classify a stemmed McKean point into the Duncan or Hanna type, however, there are also numerous examples of points that are clearly 'more Duncan' or 'more Hanna' in shape. As such, this author agrees with the use of the terms McKean Lanceolate and Duncan-Hanna, but would prefer to see individual variants identified when possible.

Previous analyses have occasionally focused on the apparent difference between McKean populations in the northern and southern portions of the Northern Plains. These differences are most apparent in subsistence strategies and the presence or absence of distinctive features and artifacts (such as slab-lined roasting

pits and grinding stones). This research indicates that the variation is due primarily to environment (grasslands versus foothill/mountain regions) and does not conform to a north/south gradient. Similarities in subsistence patterns (at some sites) have already been outlined, indicating the use of a more diverse economy in river valleys and in the Boreal Forest. Also, the recovery of grinding stones at Redtail and Gray burial supports the use of such artifacts outside of the 'core' region.

6.2 Suggestions for Future Research

Unfortunately, it should be readily obvious from this discussion that few definitive statements can be made with regard to McKean. Perhaps one of the greatest contributions of such an analysis is the realization that researchers have been basing their arguments on a limited amount of data, especially in the Canadian Plains, and have been accepting earlier interpretations of McKean without questioning some of the original assessments. The fact remains that, in many areas, the sample size is just too small to make any definitive statements regarding many of the pertinent issues with respect to the McKean series. Even within Saskatchewan, which currently boasts the best McKean record in the Canadian Plains, we are still limited to a relatively small sample of sites. In this sense, future research will require the identification and examination of a variety of site-types such as areas of lithic procurement and/or stone tool manufacturing, butchering sites, kill sites, and winter habitation sites. Particular attention should be paid to McKean components identified outside of riparian habitats (such as EgNo-23), especially with respect to McKean hunting activities.

At the site level, these future excavations must include techniques that will allow for tight control of stratigraphy. When possible, a multi-disciplinary approach is preferred. For example, an ongoing research program at the Thundercloud site has included analyses of sedimentology, geomorphology, stable isotopes, faunal remains, and lithics. This combination of studies eventually led to the identification of multiple McKean series occupations and has dramatically changed interpretations of the McKean assemblages. Excavations must also employ fine-screen recovery techniques, especially with regard to sediment from hearth features, if accurate assessments of subsistence strategies are to be presented. Finally, multiple radiocarbon dates must be associated with these analyses to help in confirming the presence of multiple occupations and to maintain and update the current chronological sequence.

At a more regional level, direct comparisons of lithic technology are needed to identify, if possible, local McKean populations. Similar studies in the United States (Keyser 1985) have provided a glimpse at the regional adaptations of a local group and helped to outline the lithic reduction sequence for Duncan-Hanna projectile points (Keyser and Fagan 1993). Unfortunately, the number of excavated McKean series projectile points is relatively small for the Canadian Plains. Even so, analysis of the entire lithic toolkit may point out the technological similarities and differences between occupations. These observations can then be expanded into direct comparisons between sites in similar physiographic settings, and ultimately such comparisons can be used to develop better regional models. Such observations will be necessary in exploring the potential separation between McKean Lanceolate and Duncan-Hanna, as well as differences in McKean adaptations to variable landscapes and local ecosystems. Finally, there is a definite need for cross border research to compare and contrast the McKean assemblages from a variety of regions. Differences in terminology (such as artifact classification and lithic typology) necessitate the use of hands-on research rather than a continued reliance on the available literature.

Of a personal interest is a better understanding of McKean/Oxbow interactions and the association of Duncan-Hanna with Pelican Lake. If people using McKean Lanceolate projectile points truly represent migrants why is there no evidence of interaction between people of the McKean series and the Oxbow complex? What is the role of the Gray Burial site, if any, in relation to this interaction? At the opposite end of the spectrum, what factors are related to the rapid replacement of Duncan-Hanna projectile points by later corner-notched styles? Do the projectile points from sites such as Saahkómaapína truly represent transitional forms? Luckily Oxbow, McKean and Pelican Lake components have already been identified at Thundercloud and EgNo-23. Furthermore, future excavations are planned at both of these sites and will undoubtedly shed light on some of these issues. Research will also focus on re-evaluating the occupations at the Redtail site. In particular, further excavations of occupations 8 to 15 are needed to confirm the number of McKean occupations as well as further exploration of the pithouse in Level 8. Regardless of the cultural context, such data is invaluable to interpretations of Middle Period lifeways in Saskatchewan.

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Appendix A

EgNo-23: A New McKean Kill Site and Multi-Component Occupation

The following discussion provides a detailed analysis of the McKean series components from EgNo-23 near Elbow, Saskatchewan. This summary currently serves as the primary site report for these components.

A.1 Disturbed Bone Bed

Archaeologists from FMA recognized the potential significance of the bone scatter at EgNo-23 and collected the majority of the exposed specimens for later analysis. The exact dimensions and location of the disturbed bone bed were not recorded, although several pictures are available and have been examined to provide an approximation of the size of the collection area (see Figure A.1).

All lithic material from within the collection area was boxed and recorded. Both a Besant and a McKean Lanceolate projectile point (Figure A.2:a) were recovered in association with the faunal elements. Besant kill sites are much more common in Saskatchewan leading to the initial conclusion that the bone represented a Late Period kill. The discovery of buried faunal remains in the pipeline trench cast some doubt on this conclusion. The approximate depth of these materials, between 40 and 50 centimeters below surface, suggests that the kill was associated with the lowermost paleosol. All of the Besant occupations at EgNo-23 are located within the top 20 centimeters of soil. Many of the artifacts from these levels have been impacted by farm machinery and Besant points were commonly recovered during a later surface survey of the site locality. A second McKean Lanceolate point (Figure A.2:b) was also recovered in the vicinity of the bone bed at this time. Later excavations revealed that the occupation associated with the McKean Lanceolate points is more deeply buried (below 45 centimeters) and no McKean Lanceolate points were recovered from the surface with the exception of these two specimens (Figure A.2).

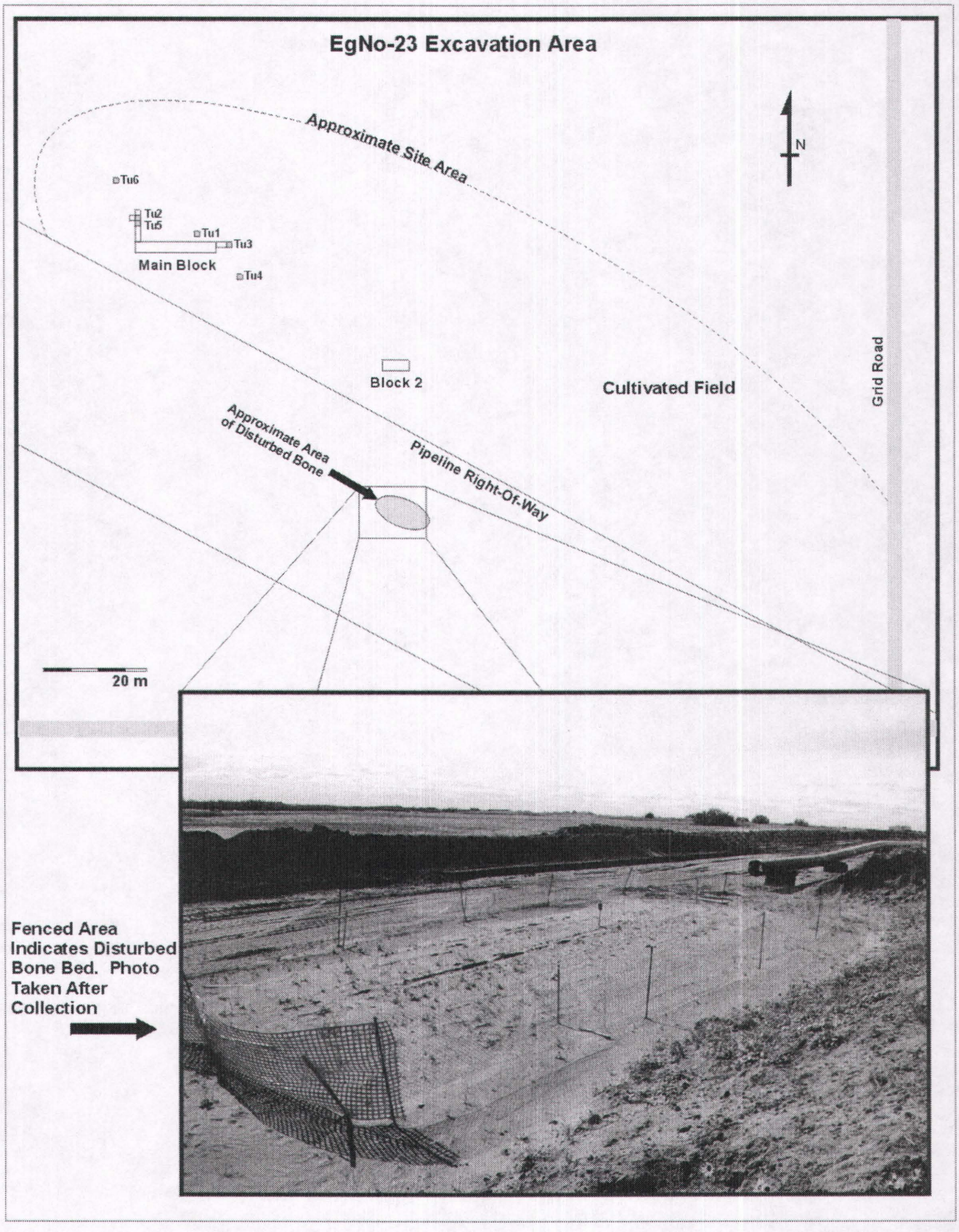

Figure A.1. Generalized Map of EgNo-23 Excavation Area with Photo Insert of Disturbed Bone Bed.

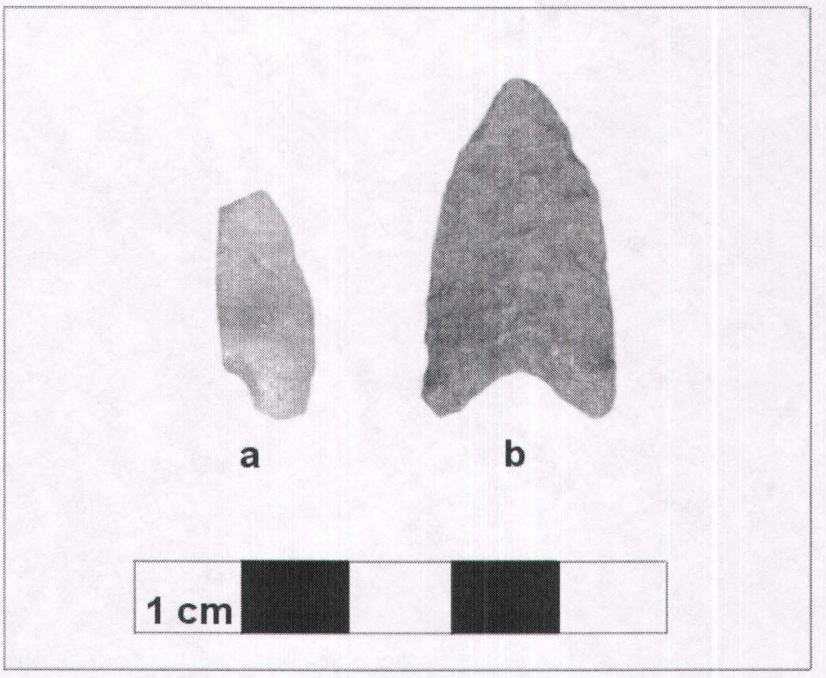

Figure A.2 McKean Lanceolate Projectile Points Recovered in Association with the Disturbed Bone Bed.

Two of the faunal elements collected from the disturbed bone bed were submitted to Brock University for radiocarbon analysis. Two right bison radio-ulna were chosen to ensure that different animals were represented. The resulting dates (Table A.1) are extremely close in age and corroborate the projectile point evidence in the suggestion that the bone bed represents a McKean series kill.

Table A.1. Radiocarbon Dates and Associated Projectile Points from the Disturbed Bone Bed at EgNo-23.

Area	Radiocarbon Date			Lab Number	Assoc. Projectile Points
	Calculated Age	Normailzed Age	Calibrated Age*		
Disturbed Bone Bed	3540±50	3620±50	4086-3733 BP	BGS 2366	McKean Lanceolate/Besant
	3530±50	3613±50	4085-3730 BP	BGS 2386	McKean Lanceolate/Besant

* Based on the 2 Sigma calibration from intercepts (calibration source Struiver and Reimer 2000, CALIB 4.3).

A.1.1 Patterns of Weathering and Bone Modification

Bone weathering was recorded by stage as defined by Behrensmeyer (1978). The bulk of the disturbed bone bed shows little or no sign of weathering (Figure A.3). Early stage weathering (stages 1 and 2) is commonly expressed by a series of small crack lines in the cortical surface of the bone. Advanced stage weathering (stages 3 to 5) was not recorded although it is unlikely that heavily weathered specimens would have been recovered in the field during surface collection. Based on the relatively high percentage of specimens that exhibit no weathering (73.5%) much of the assemblage appears to have been rapidly buried soon after the initial deposition.

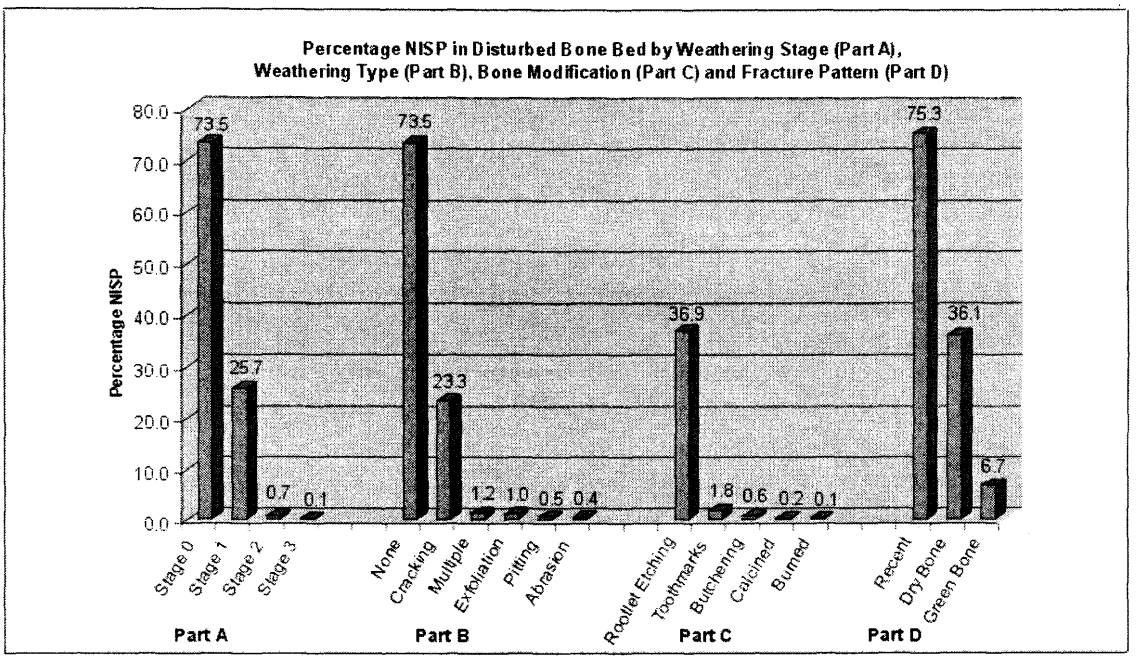

Figure A.3. Percentage NISP of Weathering and Bone Modification.

Etching by plant rootlets was recorded on just over one third of the identified specimens but is underestimated due to bone fragmentation. All complete elements and larger bone fragments show some degree of rootlet etching and occasionally a small mass of rootlets remained attached to the bone surface. The etching does not appear to have accelerated bone deterioration, but has decreased the likelihood of identifying small cut marks. The percentage of tooth marks also appears to be underestimated. Rodent chewing is particularly common on distal limb elements, carpals, tarsals, and phalanges and has undoubtedly removed evidence of small cut marks as well.

Butchering evidence is limited to a small number of cut marks and impact fractures. Cut marks were recorded on the following elements (number of cut marks in parentheses): coronoid process of a mandible (1), thoracic spine (4), rib tubercle (1), rib body (4), proximal scapula (3), deltoid tuberosity of a humerus (2), proximal astragalus (3), proximal metacarpal (5), mid shaft of a metacarpal (8), distal metacarpal (1), and a proximal first phalanx (2). While limited in number, the various marks appear to represent different stages of butchery. Marks recorded on the ribs, vertebrae and humerus are associated with muscle attachments and can be attributed to filleting. Marks on the coronoid of the mandible are associated with the temporalis muscle and are likely representative of dismemberment. Similar activities may be indicated by the marks on the scapula, astragalus, distal metacarpal, and first phalanx. The cut marks on the proximal and mid shaft segments of the metacarpal are not associated with a muscle attachment or joint and are likely the result of puncturing the skin for hide removal.

A small v-shaped butchering mark was recorded on one of the longbone fragments (Figure A.4:a). The mark is 6.2 millimeters in depth and has a measured angle of 60 degrees. It appears to represent the point of impact from a relatively sharp bifacial tool. A rib fragment has a smaller "notch" that may represent the penetration of the rib cage by a projectile point (Figure A.4:b). The notch is 2.5 millimeters in depth.

Impact fractures are present on two innominate fragments, a proximal femur and several long bone fragments. Fractures on the innominate are located just above and below the acetabulum isolating the area to allow for easier access to the femoral joint. Repeated impact fractures on the proximal femur (Figure A.5) may also indicate attempts at dismemberment, but are more likely related to the removal of nutrient rich bone marrow.

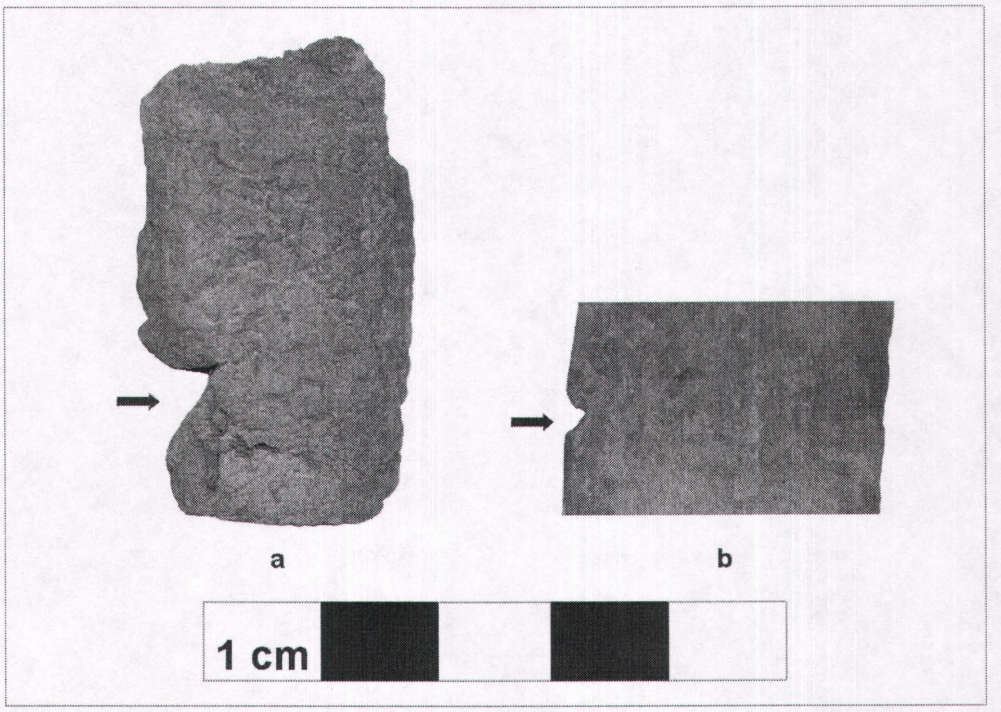

Figure A.4. Location of a "v-shaped" Butcher Mark (a) and Area of Projectile Point Impact (b) on Several Specimens from EgNo-23.

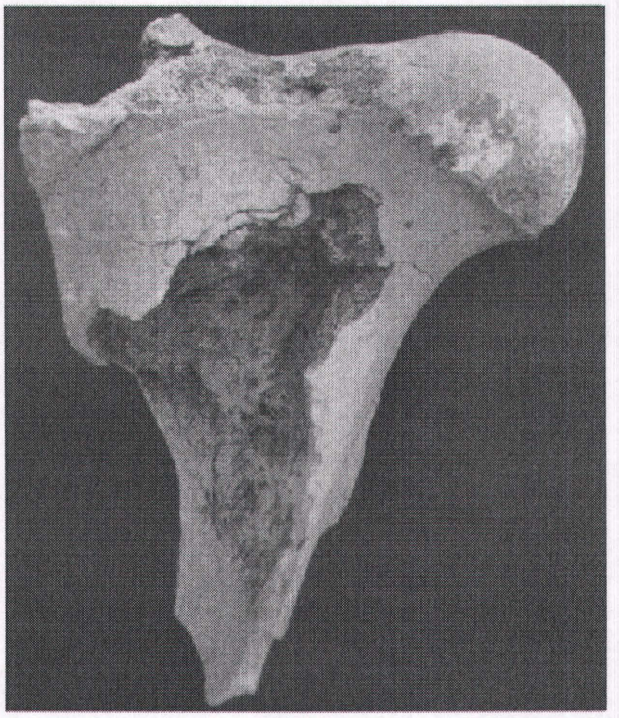

Figure A.5. Proximal Femur from Disturbed Bone Bed Exhibiting Multiple Impact Fractures.

A number of coronoid processes have been separated from the mandible indicating a breakage pattern related to the disarticulation of the temporal mandibular joint. Fractures are most common along the base of the coronoid process but are equally frequent down the length of the ascending ramus forming a diagonal or transverse fracture across the width of the proximal mandible.

The removal of marrow is indicated by the presence of hollowed marrow cavities in the proximal or distal ends of three tibia, two radii, a femur and a humerus. In all cases the cancellous bone exhibits a scooped out appearance. All of the elements have clean spiral fractures with no tooth marks eliminating carnivores as a possible cause of this modification.

Only four burned and eight calcined specimens were identified with a total weight of 27.1 grams. It is very difficult to draw conclusions from this data since it is highly unlikely that burned and calcined specimens would have been recovered during collection. Unfortunately, time constraints prevented the use of screens during the bone bed recovery and it is possible that burned and calcined specimens are under-represented.

When all fracture patterns are taken into account, recent fractures are by far the most common (present on 75.3% of all specimens). While this percentage is high, few specimens were dramatically altered during re-deposition and in most cases new fractures were limited in number and small in size. Dry bone fractures are far less common by percentage (36.1%), but have played a larger role in fragmenting long bones. Smaller elements such as carpals, tarsals and phalanges remain relatively complete. While it is true that any artifact association has been irrecoverably lost many of the elements remain complete enough to permit accurate identification.

A.1.2 The Bison Assemblage

A total of 4249 faunal specimens were collected from the pipeline right-of-way with a combined weight of 79.583 kilograms. Over 50% of these specimens have been positively identified as belonging to elements from bison (*Bison bison*). The remaining specimens are too fragmented for species identification, but are robust enough to be representative of a large artiodactyl. They should be considered fragments of the aforementioned bison elements.

A record of the frequency of anatomical landmarks was used to obtain the minimum number of elements (MNE) and ultimately the minimum number of individuals (MNI). The calculated frequency for each landmark in included in Appendix B, Table B.1. Based on the number of third mandibular molars at least 18 bison are represented by the recovered faunal assemblage (Table A.2). It is believed that most of these represent mature individuals. No foetal elements were recovered and unfused epiphyses are relatively rare (maximum of two to three individuals). A comparison of the distal long bone epiphyses to the specimens in the collection at the University of Saskatchewan suggests that all of the immature individuals are over one year of age.

In terms of the %MAU (minimum number of animal units), mandibles and first and second phalanges are the most numerous elements although mandibular counts are largely the result of individual molars that have been isolated from the alveolus. There is a considerable gap between the %MAU of the second phalanx (70.8) and the next most common elements (the metacarpal and astragalus both at 52.8). It appears that most elements are poorly represented in the assemblage. Some elements, such as the thoracic vertebrae are common by NISP (number of identified specimens) and, in my opinion, are underestimated by the MNE.

A correlation between %MAU and volume density was conducted to assess the effects of density-mediated preservation. The result (r_s=0.28) suggests that there is no correlation and that the observed element frequencies are culturally related. Some caution should be used in interpreting this result, as it is very difficult to assess the extent of excavation related damage. Still heavy equipment should have had the greatest impact on the least dense elements mirroring the effect of a positive correlation between density and %MAU.

A.1.3 Bison Age Determination

Research into the creation of bison age sets has focused primarily on the mandible and the mandibular molars (Frison 1982; Frison and Reher 1970; Reher 1973; 1974; Todd and Hofman 1987; Todd et.al. 1996). These studies include the examination of dental eruption, rates of wear, and the height of the metaconid on the mandibular teeth. Several studies have also outlined eruption schedules for maxillary molars (Dyck and Morlan 1995; Wilson 1980). Given the small number of maxillary teeth recovered from EgNo-23 analyses are focused on the examination of mandibular teeth only.

Table A.2. Summary of Bison Elements, Volume Density (VD), and Density Scan Sites (from Kruetzer 1992) from the Disturbed Bone Bed at EgNo-23.

	NISP	MNI	Total MNE	Total MAU	% MAU	VD	Scan Site
Axial Skeleton							
Cranium	77	5	7	3.50	19.4	NA	NA
Mandible	355	18	36	18.00	100.0	NA	NA
Hyoid	4	2	3	1.50	8.3	0.36	HYOID
Sternum	0	0	0	0.00	0.0	NA	NA
Atlas	11	6	6	6.00	33.3	0.91	AT2
Axis	13	6	6	6.00	33.3	0.65	AX1
Cervical vertebrae	36	5	20	4.00	22.2	0.37	CE1
Thoracic vertebrae	203	6	73	5.21	28.9	0.42	TH1
Lumbar vertebrae	61	4	19	3.17	17.6	0.31	LU1
Sacrum	4	4	4	4.00	22.2	0.27	SC1
Caudal Vertebrae	8	1	6	0.43	2.4	NA	NA
Forelimb							
Scapula	71	6	9	4.50	25.0	0.5	SP1
Humerus	35	7	12	6.00	33.3	0.38	HU5
Radius	42	8	15	7.50	41.7	0.48	RA1
Ulna	25	5	8	4.00	22.2	0.34	UL1
Internal carpal	11	8	11	5.50	30.6	0.35	LUNAR
Radial carpal	12	9	12	6.00	33.3	0.42	SCAPHOID
Accessory carpal	2	1	2	1.00	5.6	NA	NA
Ulnar carpal	11	6	10	5.00	27.8	0.43	CUNEIF
Unciform carpal	6	3	6	3.00	16.7	0.44	UNCIF
Fused 2/3 carpal	13	8	13	6.50	36.1	0.52	TRAPMAG
Metacarpal	38	10	19	9.50	52.8	0.6	MC4
5th metacarpal	0	0	0	0.00	0.0	NA	NA
Hindlimb							
Innominate	29	4	7	3.50	19.4	0.53	AC1
Femur	29	4	8	4.00	22.2	0.26	FE6
Patella	8	5	8	4.00	22.2	NA	NA
Tibia	41	10	13	6.50	36.1	0.41	TI5
Lateral malleolus	5	3	5	2.50	13.9	0.56	LATMAL
Calcaneus	24	8	12	6.00	33.3	0.8	CA2
Astragalus	21	10	19	9.50	52.8	0.62	AS2
Fused C/4 tarsal	12	7	11	5.50	30.6	0.77	NC3
Fused 2/3 tarsal	5	3	5	2.50	13.9	0.5	2&3CP
1st tarsal	0	0	0	0.00	0.0	NA	NA
Metatarsal	18	5	8	4.00	22.2	0.51	MR4
2nd metatarsal	0	0	0	0.00	0.0	NA	NA
5th metatarsal	0	0	0	0.00	0.0	NA	NA
Other elements							
1st phalanx	63	10	58	14.50	80.6	0.48	P13
2nd phalanx	52	8	51	12.75	70.8	0.41	P21
3rd phalanx	29	5	28	7.00	38.9	0.32	P31
Proximal lateral sesamoid	4	1	4	0.50	2.8	NA	NA
Proximal medial sesamoid	11	2	10	1.25	6.9	NA	NA
Distal inferior sesamoid	4	1	4	0.25	1.4	NA	NA
Miscellaneus							
Vertebrae indeterminate	156	-	-	-	-	-	-
Metapodial indeterminate	13	-	-	-	-	-	-
Rib indeterminate	658	-	-	-	-	-	-
Longbone indeterminate	112	-	-	-	-	-	-
Tooth indeterminate	22	-	-	-	-	-	-
Ossified cartilage	3	-	-	-	-	-	-

% MAU versus Volume Density: r_s =0.281; P>0.1, N=29

The sample of mandibles and teeth from EgNo-23 is extremely small. Only five mandibles were recovered and all of the specimens are missing a portion of the tooth row. At present there has been no study of dental eruption and enamel attrition for bison herds in the Canadian Plains. The following age sets are based on comparisons of the EgNo-23 material to descriptions provided in the literature noted previously. Interestingly it appears that the five mandibles represent individuals from five different age groups:

Age Group 2: 1.2 - 1.4 years. One mandible with a partial tooth row including dP_3, dP_4, M_1 and M_2. The surface of the M_1 is in wear and the exostylid is 9 millimeters below the occlusal surface. The M_2 is erupted but un-worn and the metaconid is 11 millimeters above the level of the alveolus. The mesial margin of M_2 is 12 millimeters below the distal margin of M_1. The anterior exostylid of dP_4 is not yet in wear. The pattern is closest to individuals between 1.2-1.4 years at the Lipscomb site and less than the 1.4 year-old specimens from Wardell (Todd et.al.1996: 151).

Age Group 6: 5.2 - 5.4 years. One mandible including P_2, P_3, P_4, M_1 and M_2. All teeth are in full wear. The M_1 fossetids are similar in size and the base of the M_1 enamel is just at the level of the alveolus. The M_2 exostylid has just begun to wear. This specimen is between age groups 6 and 7 from the Mill Iron site (Todd et.al.1996: 161). It is included in age group 6 based on the metaconid height of the M_1 (31.4 mm).

Age Group 8: 7.2 – 7.4 years. One mandible including P_3, P_4, M_1, M_2 and M_3. All teeth are in full wear. The prefossetid on M_1 is slightly reduced in size. The base of the enamel on M_2 is below the level of the alveolus. All of the exostylids are in wear but not connected to the occlusal surface on M_3. The hypoconulid is just attached to the primary occlusal surface of M_3. This specimen is very similar to specimens from Age Group 8 (7.0 – 7.2 years) from the Mill Iron site (Todd et.al.1996: 161). Height of the M_1 and M_2 metaconids are 23.9 and 40.1 mm respectively.

Age Group 9: 8.2 – 8.4 years. One mandible including M_2 and M_3. Both molars are in full wear. The exostylid is connected on M_2 but not on M_3. The base of the enamel on M_2 is near the level of the alveolus. The height of the M_2 metaconid is 34.1 mm.

Age Group 10: 9.2 – 9.4 years. One mandible including M_1, M_2 and M_3. All teeth are in full wear. A small portion of the M_1 prefossetid is still present. The occlusal surface of M_1 is slightly flattened. The exostylid of M_3 is not attached to the primary occlusal surface and the base of the M_3 enamel is not at the level of the alveolus. The M_1 metaconid is damaged but is below 20 mm. The M_2 metaconid is 21.4 mm in height.

There are no individuals from age group 1 (0.2 – 0.4 years). Isolated teeth represent individuals from age groups 3,4,5 and 7. These groups are determined solely on metaconid heights from individual molars as compared to the molars from the mandibular specimens mentioned above (Figure A.6 and Appendix B, Table B.2 and Table B.3). The MNI represented by each age group was determined by examining the first and second molars. The third molars were the most difficult to separate into age groups and were not used in this calculation. The MNI from the age groups equals 19 and is very close to the estimate of 18 provided by the MNE.

A.1.4 Bison Gender Determination

The determination of gender in bison relies heavily on the ability to separate elements of large adult bulls from the smaller cows and immature males. Standardized measurements are available to compare the major bison limb elements (Speth 1983; Todd 1987), however, the limb elements from EgNo-23 are few in number and are heavily fragmented. Similar methods have been proposed for bison front phalanges (Roberts 1982) and for the carpals and tarsals (Morlan 1991). These elements are more numerous and provide the basis for the following discussion.

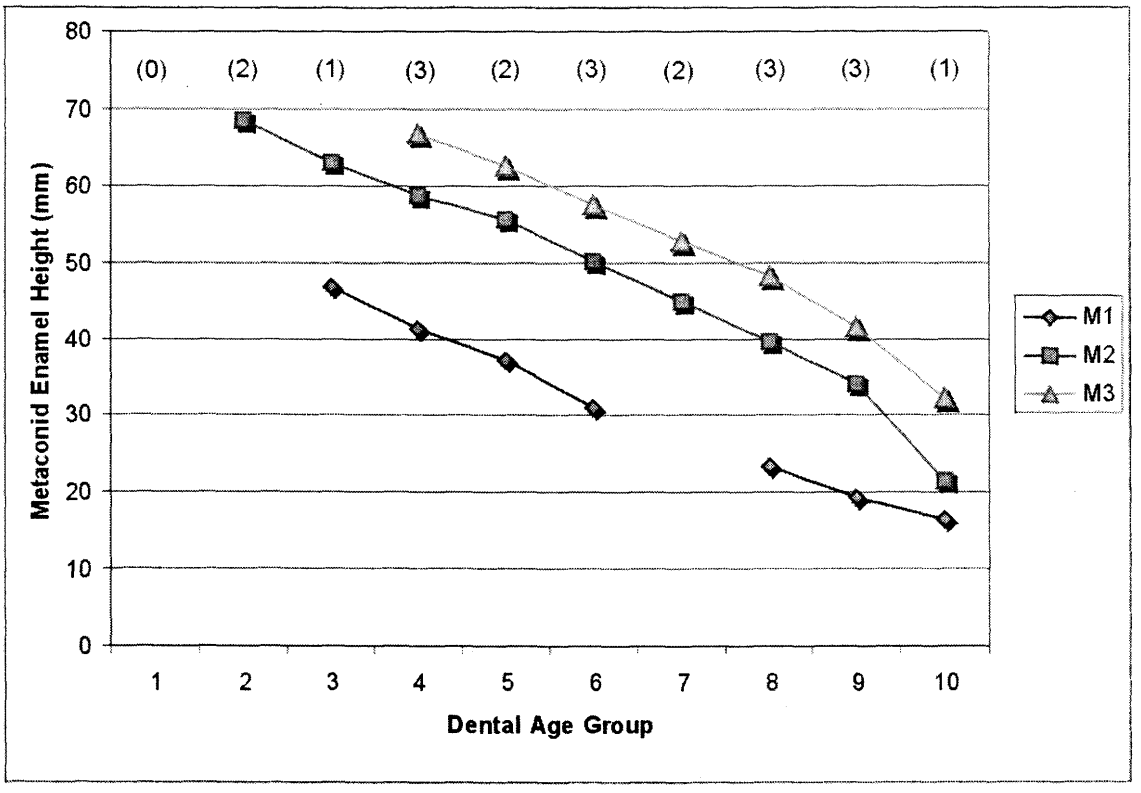

Figure A.6. Average Metaconid Enamel Height for Bison Dental Age Groups, MNI in Parentheses.

Roberts (1982:56-59) outlines several non-metric attributes useful in separating front phalanges from hind phalanges in adult bison. Once separated into forelimb and hindlimb, discriminant function analysis of length (L), greatest length (GL) and distal height (D) of the front phalanges provides the best method of separating males from females (Roberts 1982:70). Roberts reports a clear separation in three different samples, demonstrated by a histogram of the discriminant function (Roberts 1982:94).

A total of 21 first front phalanges were complete enough to provide accurate measurements (Appendix B, Table B.4). A bar graph of the discriminant function was compared to the Elk Island bison sample provided by Roberts (1982:71) (Figure A.7). At least 19 of the phalanges representing 11 individuals are distinctly male. Two of the specimens are located at the lower end of the male population and may represent a smaller male or large female. Only one specimen clearly falls within the range of modern females and based on fusion and overall robusticity it is not believed to be from an immature individual.

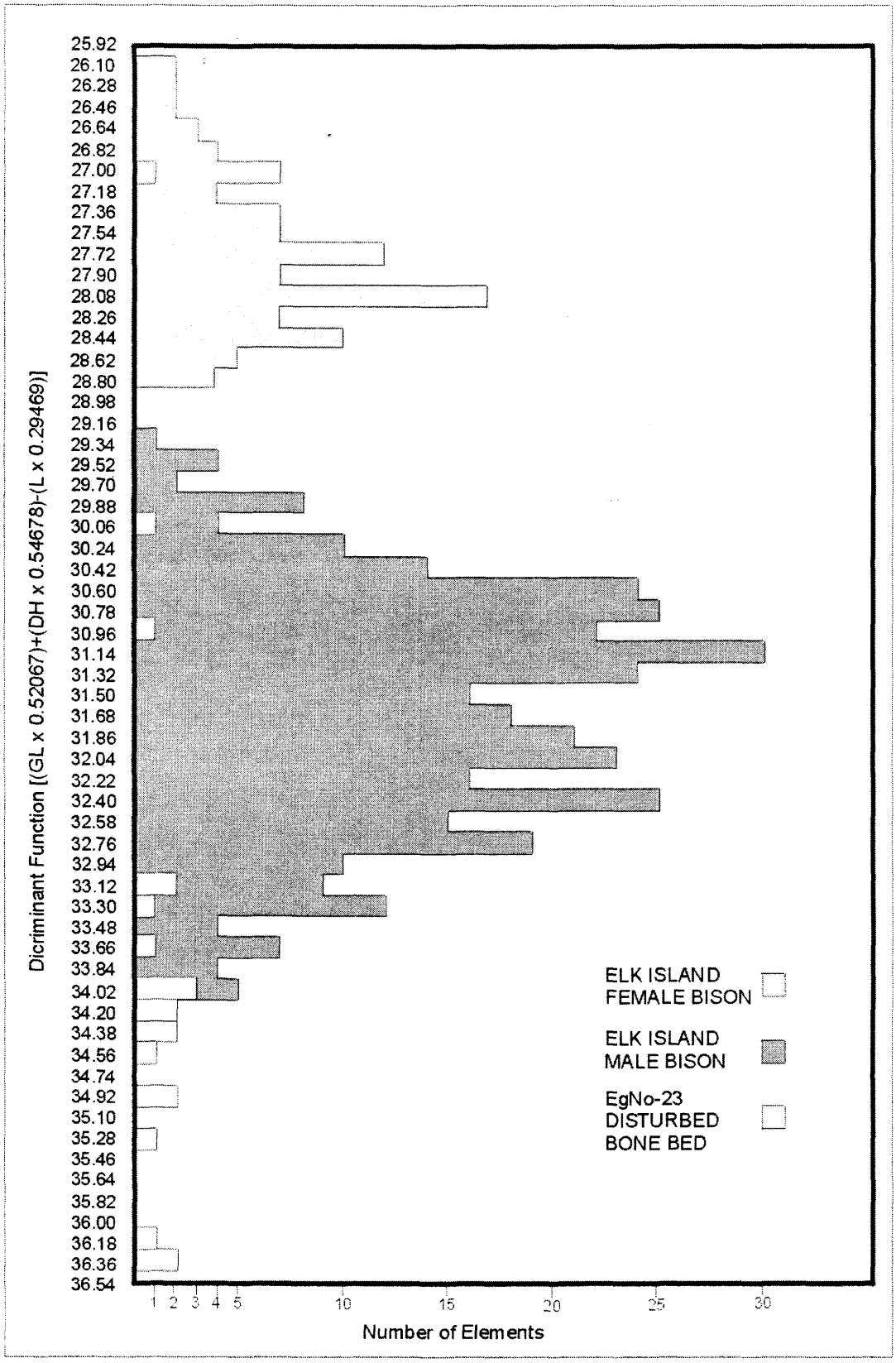

Figure A.7. Bar Graph of the Discriminant Function on the Elk Island Sample (From Roberts 1982:72) and the Sample from the EgNo-23 Disturbed Bone Bed.

Measurements of carpals and tarsals follow procedures outlined by Morlan (1991:218-225). A summary of all measurements is included in Appendix B Table B.5, B.6, B.7 and B.8. A series of bivariate plots are used to compare the data in an attempt to separate mature males from cows and immature males.

Bivariate plots of the carpal data give somewhat inconsistent results (Table A.3). The internal and radial carpals are closest to the phalangeal data in suggesting the presence of a single female among a large number of males. The plots of the unciform and fused 2/3 carpal indicate at least two females, while the ulnar carpal suggests the presence of as many as three females. The measurements from the unciform carpal revealed no adult males and the data appear somewhat unreliable. Morlan (1991:223) notes that the use of the unciform to distinguish gender requires further research. In all of the plots there are one or two individuals that appear to be intermediate between female and male, but are generally closer to the male group. These may suggest the presence of very large females but are more likely representative of smaller males. Similar results are also indicated by the discriminant function analysis of the front phalanges.

The bivariate plots of the tarsal data are much more consistent in their results. The astragalus and fused central/fourth tarsal suggest the presence of a lone female among a number of males. Measurements from the remaining tarsals and the lateral malleolus suggest that only males are present. As with the carpal data, there are several individuals that are interpreted here as smaller males (astragalus, calcaneus and tarsal 2/3), especially several of the calcanei that have recently fused epiphyses.

Table A.3. Summary of NISP and MNI (in Parentheses) of Female/Calf, Immature Male and Mature Male Bison From Carpal and Tarsal Measurements.

Gender	Internal	Radial	Ulnar	Carp 2/3	Unciform	Astrag.	Calc. A	Calc. B	Tars C/4	Tars 2/3	Lat Mall
Female	1 (1)	1 (1)	3 (3)	3 (2)	4 (2)	1 (1)	0 (0)	0 (0)	1 (1)	0 (0)	0 (0)
Small Male	2 (1)	4 (3)	2 (2)	2 (1)	2 (1)	4 (3)	2 (2)	1 (1)	0 (0)	2 (1)	0 (0)
Male	3 (2)	7 (5)	5 (3)	6 (4)	0 (0)	7 (4)	4 (2)	7 (4)	5 (5)	2 (1)	4 (2)

A.1.5 Summary and Conclusions

An analysis of the mandibular teeth suggests the presence of at least 19 bison in nine different age groups. These groups range from 1.2-1.4 years to 9.2-9.4 years of age. This designation is tenuous due to the small sample of semi-complete mandibles recovered from the site. Assuming that the data are correct and that bison birth in a relatively tight schedule between mid-April and mid-June the bison assemblage from EgNo-23 best represents a mid to late summer kill episode.

Metric analyses of the carpals, tarsals, and phalanges suggest that the bison herd was predominantly male. Several immature males are indicated, unfortunately the exact age of these individuals is difficult to assess. Epiphyseal fusion and a lack if mandibular elements from age group 1 suggest that these individuals are over one year of age. A lone female was also recorded.

Based on the presence of several McKean Lanceolate projectile points and the corroborating radiocarbon dates the assemblage is best described as a McKean series kill. Future analysis of the site sedimentology may aid in interpreting the exact nature of the kill event. Currently it is believed that the animals were ambushed in an area of low-lying sand dunes. No evidence of a structure was recorded in the initial assessment and would have been subsequently destroyed during pipeline construction. An examination of stabilized sand dunes adjacent to the site may yield clues to the environment at the time of occupation. At present many of these dunes are tightly spaced and do not form linear ridges more common in active dunes. The thick A-horizon noted for the McKean occupations suggests that the sand dunes were relatively stable during the Middle Middle Prehistoric (Middle Archaic) Period as well. Under these circumstances, it seems more likely that the site area served as a natural trap providing enough cover for an ambush style of hunting, similar in a sense to the strategy postulated by Brumley (1975:192) for the area surrounding the Cactus Flower site in Alberta.

A.2 Buried Components

Buried components were identified in all of the test units and in both of the block excavations. A total of 57 square meters were excavated at EgNo-23. Ten of these represent 1 x 1 meter test units separated by as much as 95 meters. Only the test units in immediate proximity to the main excavation block are included in this analysis (units abbreviated **Tu** in Figure A.1). Block 2 represents a smaller excavation located 20 meters south and 31 meters east of the main excavation. The surface occupations in block 2 were impacted by heavy machinery during the construction of a pipeline monitoring station. Below the impacted zone the paleosols are weakly developed and artifacts are sparse. In light of the high probability of error associated with any attempt to compare these units data from block 2 are not included here.

A.2.1 Cultural Stratigraphy

The cultural stratigraphy at EgNo-23 is somewhat complex. In the westernmost excavation units, the cultural deposits are more shallowly buried and the compacted nature of the paleosols suggests a slower rate of sedimentation. The maximum depth of cultural materials is approximately 80 centimeters below surface. Four main cultural "zones" could be identified in these units (Figure A.8).

Deeper burial as a result of increased sedimentation between the layers in the eastern portion of the main block has separated several of the cultural "zones" into distinct occupations. Cultural occupation 4 is no longer evident in the eastern units and the paleosols are up to 20 centimeters deeper than corresponding levels in the western units.

A total of seven cultural occupations (1a, 1b, 1c, 2a, 2b, 3, and 4) were identified at the site. Cultural occupation 1c was present in only three units of the main block, but included the bulk of the bone recovered from excavated contexts. Occupation 4 was limited to the western end of the main block and was not associated with a distinct paleosol. Cultural affiliation has been assigned to all of the occupation levels by using a combination of radiocarbon dating and/or projectile point typology (Table A.4).

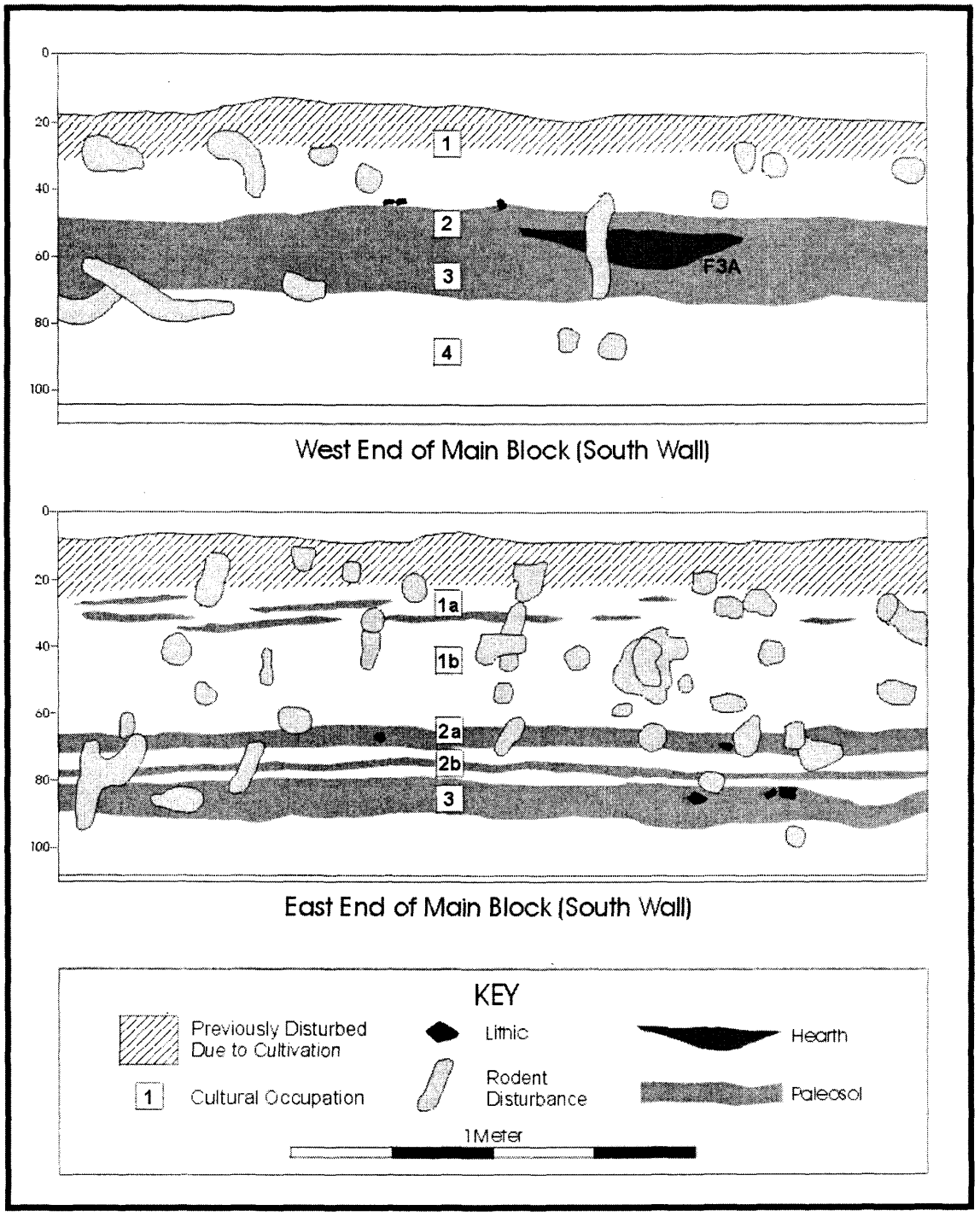

Figure A.8. Cultural Stratigraphy from the Main Excavation Block at EgNo-23.

Table A.4. Radiocarbon Dates and Associated Projectile Points from EgNo-23.

Occupation	Radiocarbon Date			Lab Number	Assoc. Points
	Calculated Age	Normailzed Age	Calibrated Range*		
1a	No date	No date	No date	N/A	Besant
1b	No date	No date	No date	N/A	Pelican Lake
1c	1880±50	1954±50	2000-1800 BP	BGS 2365	Pelican Lake?
Sand b/w 1 & 2	2800±40	2900±40	3160-2920 BP	Beta-167309	Pelican Lake
2a	3348±50	3427±50	3830-3565 BP	BGS 2363	Duncan-Hanna
2b	3430±40	3520±40	3890-3650 BP	Beta-167310	Hanna?
Level 2	3440±55	3537±55	3980-3640 BP	BGS 2364	Hanna
3	4140±60	4240±60	4870-4575 BP	Beta-183521	McKean Lanceolate
4	1860±40**	1960±40**	1990-1830 BP**	Beta-167311	Oxbow

* Based on the 2 Sigma calibration from intercepts (calibration source Struiver and Reimer 2000, CALIB 4.3).
** Erroneous date, possible diagenetic change to bone due to calcium carbonate concentration in lower sediments.

Occupations 2a, 2b and 3 are of particular interest to the present study. Occupation 3 is clearly defined in the stratigraphy and was easily separated from level 2 even in the western block where several of the occupations occur in one large paleosol. Unfortunately, occupations 2a and 2b are not separate entities in the western portion of the main block. Given the fact that both are considered to be part of the later phase of the McKean series (Duncan-Hanna) with close radiocarbon dates this does not seem surprising. Still, in an attempt to delineate activity patterns separate analyses were undertaken when possible. In the western units materials from occupations 2a and 2b were catalogued together as level 2.

A.2.2 Cultural Level 2

The compact stratigraphy in the western excavation units made separating occupations 2a and 2b all but impossible in 23 of the excavation units. Cultural materials from these units are simply designated as cultural level 2. This level is comprised of at least two occupations and both are associated with Duncan and/or Hanna style projectile points. A summary of the artifacts from level 2 is provided here as a supplement to the description of materials from occupations 2a and 2b.

Cultural materials from level 2 were recorded between 25 to 48 centimeters below the surface. The associated paleosol split into distinct occupations approximately midway (east/west) through the main block. A single radiocarbon date of 3440±55 rcybp (BGS-2364: cal 3977 [3785] 3644) was obtained from a bone sample in feature 3A. The feature is located near the bottom of level 2 and is thought to be associated with cultural occupation 2b (Table A.4).

Features

Four features were uncovered in level 2 and all are located in the southwestern end of the main excavation block (Figure A.9). Features 3A, 3B and 5 were recorded at the same depth (between 31 and 35 cm below the surface). Given their location in the bottom portion of the paleosol they are likely associated with cultural occupation 2b. Feature 6 was recorded at a slightly higher depth (29 cm below the surface) and cannot be confidently placed in either of the identified occupations. Given the similarities between the lithic debris in features 3A and 6 it is possible that they belong to the same occupation.

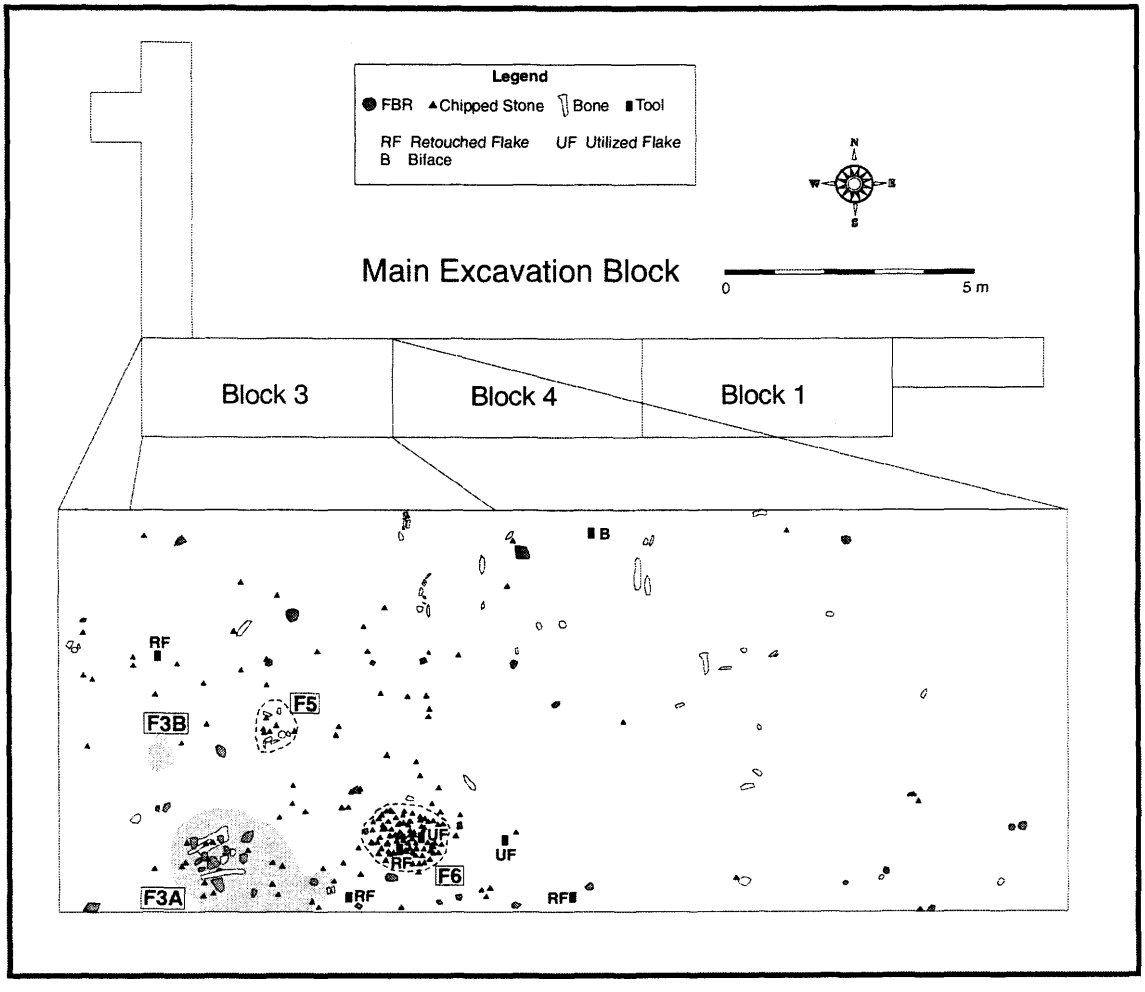

Figure A.9. Partial Planview of Cultural Level 2.

Feature 3A (Figure A.8; A.9): This is a large basin-shaped feature that was partially excavated. A profile is provided in Figure A.8. The sediments that comprised this feature were blackened and greasy and contained minute inclusions of ash and charcoal. The outline is 85 cm at the widest point of measurement and extends as much as 50 cm north of the wall profile. The outer edges were approximately 5 cm in depth and soil samples included a number of small flakes and bone fragments. The core of the feature was approximately 15 cm in depth with a diameter of 40 cm. Most of the artifacts associated with feature 3A were located within this core area. A total of 24 fragments of fire broken rock were recovered weighing 1622.1 grams. Many of the 65 bone fragments that were recovered could not be identified. A complete bison radio-ulna was discovered near the bottom of the feature and was submitted to Brock University for radiocarbon analysis (BGS-2364; Table A.4). Sediments at the base of the feature were not oxidized suggesting that the primary function was not as a hearth. Many of the fragments of fire-broken rock exhibit water fractures typical of stone boiling features. Several of the larger bone fragments exhibit spiral fractures and evidence for burning was not recorded. The extension of the feature to the southeast may suggest the presence of a spill area used to clean the pit for re-use.

Feature 3B (Figure A.9): This is a small organic stain located to the northwest of Feature 3A. Sediments from this feature are blackened and greasy. They are similar in appearance to sediments from feature 3A. The stain measured 18 cm in length, 13 cm in width and had a depth of only 2 cm. The outline is roughly oval in shape and there were no artifacts recorded in the feature. Assuming that feature 3A was used to boil water, perhaps to procure bone grease or to make a meal, it is possible that this small stain represents a spill area or is related to the overall maintenance of the boiling pit.

Feature 5 (Figure A.9): Feature 5 is a small surface cluster of lithic debitage and bone fragments located approximately 40 cm north of feature 3A. The artifacts are tightly spaced in a 20 by 15 cm area. A total of 20 bone fragments, most heavily fragmented, were associated with five large lithic flakes. All of the flakes are comprised of Swan River chert (SRC) and four have been identified as platform rejuvenation flakes. Variation in the colour pattern of the platform rejuvenation flakes suggests the presence of at least two cores. Two smaller finishing flakes (also SRC) were also associated with this feature. A number of smaller SRC flakes with a similar pattern of colour and texture were also recovered from features 3A and 6.

Feature 6 (Figure A.9): Feature 6 is a large circular concentration of flakes approximately 40 cm in diameter. All of the sediment within the immediate vicinity of this feature was fine-screened in an attempt to recover the numerous tertiary flakes that were noted in the field. A total of 707 pieces of lithic debitage were recovered from these sediments with a combined weight of 110.6 grams. The most common lithic materials represented include the following (number of specimens in parentheses): quartzite (282), silicified wood (204), silicified sediment (88), silicified siltstone (65), and Swan River chert (48). Flakes of similar material (with similar proportions) were also recovered in units surrounding features 3A and 3B, further evidence that these features may be related. Flake types from feature 6 are highly suggestive of end-stage tool manufacture or tool re-sharpening and include 600 tertiary flakes (84.9%), 105 secondary flakes (14.9%) and 2 primary decortication flakes (0.3%). Two tools were identified in the feature including a utilized flake of silicified siltstone and a retouched flake made from Swan River chert.

Tools

Bifaces (n=6; Table A.5; Figure A.10): Catalogue #5075 is a complete biface made from silicified wood. It is lanceolate in shape with gently convex lateral edges and a relatively straight basal margin. The lateral edges are quite sinuous and edge wear is minimal but present. This item may have been a projectile point perform that was too thick to finish. The material is of poor quality and exhibits multiple hinge fractures that prevented further thinning. The item may also have been used as a bifacial knife for a short period of time. Smaller fragments represent the remaining bifaces. Two of these (#5081 and #5088) were recovered from feature 3A and both of the specimens are lateral edge fragments. The first is made from silicified sediment (possibly Tongue River silicified sediment) with a moderately finished lateral edge. The second is well finished and constructed from a mottled brown chalcedony. Both of these specimens exhibit bending type fractures. The remaining bifaces (#5086, #5087 and #5092) are too fragmented to determine portion or overall shape. Two of the fragments (#5086 and #5087) are made of silicified peat and can be re-fit to form what appears to be a body fragment from an ovoid biface. The last is constructed from silicified wood and is possibly a lateral edge fragment although the material is quite flawed with multiple hinge fractures that obscure much of the flaking pattern.

Table A.5. Level 2 Stone Tools

Cat #	Tool Type	Weight (g)	Length (mm)	Width (mm)	Thick (mm)	Material	Figure
5075	Biface	4.9	37	18	7	Silicified Wood	A.10 a
5081	Biface	1.4	11	21	7	Silicified Sediment	A.10 c
5088	Biface	4.3	17	34	9	Brown Chalcedony	A.10 b
5086	Biface	1.1	28	12	4	Silicified Peat	
5087	Biface	3.4	29	16	9	Silicified Peat	
5092	Biface	3.4	39	16	6	Silicified Wood	
5143	MURL	0.8	26	10	3	Silicified Wood	A.11 e
5144	MURL	0.8	15	14	3	Silicified Siltstone	
5145	MURL	1.8	19	15	8	Swan River Chert	
5146	MURL	0.7	11	18	4	Quartzite	
5147	MURL	2.1	17	20	6	Silicified Wood	A.11 d
5148	MURL	4.0	26	17	8	Quartzite	
5150	MURL	1.7	22	21	4	Swan River Chert	
5151	MURL	1.4	23	13	6	Silicified Wood	
5173	MURL	19.6	44	45	8	Quartzite	A.11 b
5177	MURL	53.8	73	48	12	Indet. Chert	A.11 f
5181	MURL	?	63	69	14	Quartzite	A.11 a
5183	MURL	0.9	19	17	4	Brown Chalcedony	
5199	MURL	1.6	30	28	3	Silicified Peat	A.11 c
1480	Projectile Point	1.3	17	17	4	Swan River Chert	A.10 d
1485	Projectile Point	2.1	21	15	6	Swan River Chert	A.10 e
5137	Uniface	1.7	18	15	7	KR Chalcedony	A.10 g
5118	Wedge	2.3	21	16	7	Swan River Chert	A.10 h

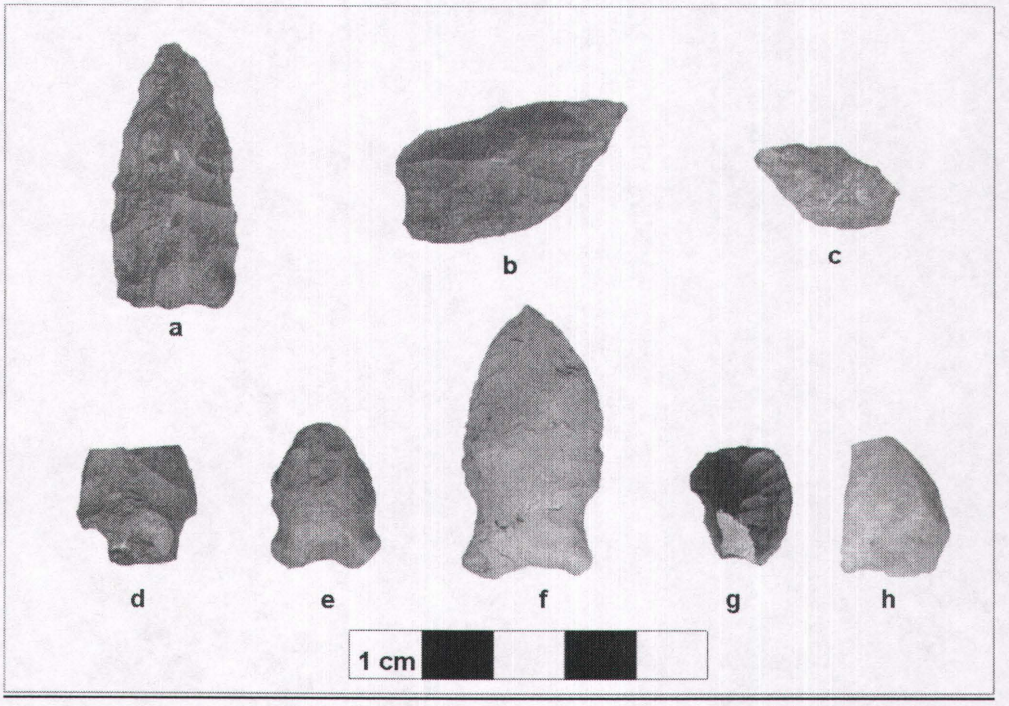

Figure A.10. Select Bifaces (a-c), Projectile Points (d-e), a Uniface (g) and a Wedge (h) from Level 2. Projectile Point (f) is from Block 2 and is Provided for Comparative Purposes.

MURLs (n=13; Table A.5; Figure A.11): This is a general tool category that includes marginally utilized or retouched lithics (MURLs). The majority of these tools appear to have minimal use wear and much of the edge retouch is small. Three of the flakes have been utilized without retouch (#5144, #5146 and #5151). Of the remaining ten flakes, four have unifacial retouch on one edge. Catalogue #5148, #5183 and #5199 have unifacial retouch along two edges while specimen #5143 and #5145 have both unifacial and bifacial retouch. Catalogue #5177 (Figure A.11:f) exhibits unifacial retouch along both lateral edges and on the rounded distal margin. All of the retouched edges show use wear although the lateral margins have been used more than the distal end. This item may have been used as a large scraping tool.

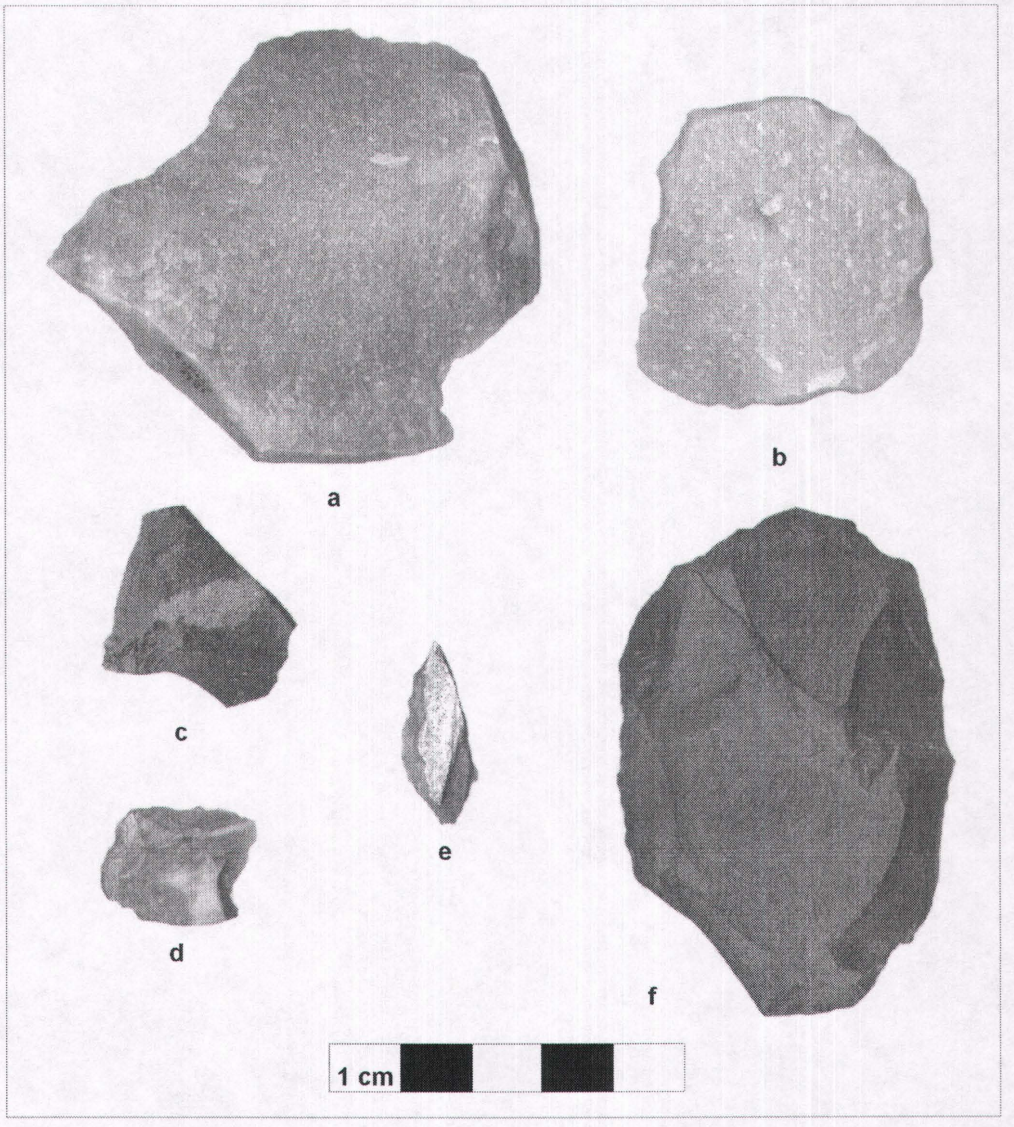

Figure A.11. Select MURLS (a-f) from Level 2.

Projectile Points (n=2; Table A.5; Figure A.10): Two projectile points were recovered from level 2, one fragmented (#1480) and one complete (#1485). Both of the points were found in test units that were later tied into the main excavation block. Catalogue #1480 was found in test unit 2 (see Figure A.1). It is made from heat-treated Swan River chert and the tip has been snapped off with a break that runs perpendicular to the long axis of the point. The body is triangular with slightly convex lateral edges and it has pronounced shoulders. Notches are shallow and asymmetrical with a gentle concavity that gives the appearance of a slightly tapered stem. The base of this point is straight. The dorsal surface of the point has a large pot lid that has prevented thinning of the stem on the right lateral edge. The point is best described as Pelican Lake and is similar to points from Sjovold (Dyck and Morlan 1995 [catno 7436]) and Saahkómaapína (Head et.al. 2003 [no 29310]). Interestingly, the points from Saahkómaapína are considered possible Hanna or transitional Hanna/Pelican Lake points. The exact depth of the point was not recorded during excavation and at the time of testing several of the occupation layers had yet to be recognized. Furthermore, the stratigraphy in the vicinity of test unit 2 is very complex and needs further study. As a result it is highly likely that this point is associated with cultural occupation 1c.

Catalogue #1485 is a complete point made from heat-treated Swan River chert. The point has been extensively re-worked producing a beveled edge along both lateral margins. The tip of the point is well rounded and shows evidence of use wear and retouch. Evidence suggests that the point was no longer functional and has been re-fashioned into a hafted drill. The base of the point has broad, shallow notches and a basal concavity. The right basal edge has been minimally re-worked due to a flaw in the material but the left basal edge is well rounded giving an "eared" appearance. The overall thickness of the body and the steep edge angles suggest that the point was originally much larger. Given the fact that the shoulders would have extended well past the basin margins prior to re-working this point is identified as Hanna instead of Oxbow. One of the projectile points from Block 2 (not included in this analysis) is clearly identifiable as the Duncan-Hanna type (Hanna variant) and exhibits an identical basal configuration (see Figure A.10:f).

Uniface (n=1; Table A.5; Figure A.10): A single uniface (#5137) was recovered in level 2. It has well patterned unifacial retouch along the right lateral edge and only marginal retouch along the left. It is roughly rectangular in shape and appears to have functioned as a side scraper although the edge angle is quite low. It is constructed from Knife River chalcedony.

Wedge (n=1; Table A.5; Figure A.10): Catalogue #5118 is an irregularly shaped wedge fragment made from Swan River chert. There is a small amount of battering along the distal edge and it appears that this item saw little use.

Lithic Debitage

A summary of the flaked lithic debitage from Level 2 is provided in Table A.6. Quartzite and silicified wood are the most commonly used lithic materials and are readily available in the Saskatchewan River valley. Silicified sediment is also quite common and many of the specimens appear to be similar to Tongue River silicified sediment from Wyoming, Montana and the Dakotas. Swan River Chert is relatively uncommon given the availability of this resource although both of the projectile points and two of the tools are made from this material.

Table A.6. Level 2 Debitage by Material and Type.

Summary by Material	Number	Weight (grams)	%N	%weight
Brown Chalcedony	19	2.3	0.8	0.2
Chalcedony	7	0.7	0.3	0.1
Crystalline Quartz	1	2.2	<0.1	0.2
Feldspathic Siltstone	35	7.5	1.5	0.6
Indet Chert	46	27.4	2.0	2.2
KR Chalcedony	5	1.8	0.2	0.1
Quartzite	836	676.4	35.9	53.8
Quartzoze	2	8.8	0.1	0.7
Silicified Peat	50	22.8	2.1	1.8
Silicified Sediment	346	139.7	14.9	11.1
Silicified Siltstone	234	170.2	10.1	13.5
Silicified Wood	573	131.6	24.6	10.5
Swan River Chert	173	66.2	7.4	5.3
Total	**2327**	**1257.6**	**99.9**	**100.1**

Summary by Type	Number	Weight	%N	
Bipolar Flake	3	13.8	0.1	
Platform Rejuv Flake	26	168.0	1.1	
Primary Flakes	41	245.9	1.8	
Secondary Flakes	663	639.9	28.5	
Shatter	24	33.0	1.0	
Tertiary Flakes	1570	157.0	67.5	
Total	**2327**	**1257.6**	**100.0**	

Secondary and tertiary flakes comprise much of the lithic assemblage and many of the secondary flakes are quite small in size (between 1 to 2.5 cm). The majority of these flakes were recovered from Feature 6. The prevalence of small flaking debitage is indicative of end stage tool manufacture and/or tool rejuvenation.

Fire Broken Rock

A total of 425 fragments of fire broken rock (FBR) were identified in level 2 with a combined weight of 7568.1 grams. The assemblage is dominated by igneous and metamorphic rock (n=304; 3950.5 g; mainly granite and gneiss). Quartzite (n=55; 1561.9 g) and sandstone (n=35; 1331.1g) are also common. Most of the specimens (n=350) exhibit water fractures and are likely the product of stone boiling associated with feature 3A.

Faunal Assemblage

A total of 2050 faunal specimens were recovered with a combined weight of 1684.0 grams. Specimens represent at least two species (*Bison bison* and *Thomomys talpoides*) as well as a number of specimens that are identified as Large Artiodactyl:

Bison bison (NISP=82, MNE=19, MNI=3): three petrous, P_2, cervical arch, thoracic centrum, four thoracic prezygopophyses, proximal radius, proximal ulna, distal ulna, internal carpal, radial carpal, unciform carpal, two first phalanges, second phalanx, two tibial shaft fragments, lateral malleolus, proximal metatarsal, inferior lateral sesamoid. All of the petrous fragments are complete enough to side and represent three different animals. One of the first phalanges lacks a proximal epiphysis and may suggest the presence a fourth individual. These specimens are not complete enough to determine age or gender and as a result the seasonality of this occupation cannot be inferred.

Thomomys talpoides (NISP=2, MNE=2, MNI=1): cranium [R&L maxilla,R&L Incisor,L M^1,M^2], mandible [P_1,M_1,M_2]. Both of these specimens were found in the same excavation unit and are lighter in colour than the surrounding bone. While not associated with a visible burrow they clearly represent intrusive elements. Rodent borrows are common throughout the units at EgNo-23 (see Figure A.8) and several live pocket gophers were encountered during excavation.

Large Artiodactyl (SC6) (NISP=189): tooth enamel (79), longbone fragments (42), rib fragments (57), vertebral fragments (7), indeterminate molar fragments (2), a cancellous bone fragment and a metapodial fragment. Based on size these specimens are most likely from a bison.

Calculations of weathering stage, bone modification and fracture pattern for levels 2 and 3 are included in Table A.7. A total of 17.1% (n=351) of the specimens in level 2 exhibit early stage weathering represented for the most part by abrasion and small crack lines. Moderate to heavy weathering was not recorded. The high incidence of abrasion (6.1% of all specimens) is unusual. Abrasion was rarely recorded in the remaining occupations with the exception of level 1. Conversely, the incidence of irregular dry bone fractures is slightly higher than all other levels with the exception of materials from the plow zone. The higher percentages of bone breakage and abrasion in the plow zone can be attributed to the impact of farm machinery on shallowly buried cultural deposits. The same cannot be said for the more deeply buried materials from level 2 yet it appears that both assemblages were subjected to similar taphonomic agents. It would appear that at the time of deposition the western portion of level 2 was only shallowly buried, perhaps even partially exposed to surface elements. These artifacts were at greater risk of increased breakage due to compaction and associated abrasion from sand particles. Trampling by large animals could easily account for this pattern.

The percentage NISP of rootlet etching is also lower than in surrounding levels. These materials are more shallowly buried than in the corresponding assemblages from the eastern portion of the excavation block. These upper sediments drain more rapidly inhibiting the development of major root systems. No tooth marks, cut marks or impact fractures are evident although cultural modification may be present on a tibia shaft fragment (cat #16619) that is rounded and slightly polished on one end. Calcined and burned specimens are relatively rare and nearly all of the recorded specimens were associated with Feature 3A.

Table A.7. NISP and Percentage NISP (in parentheses) Separated by Weathering, Bone Modification and Fracture Pattern for McKean Series Occupations at EgNo-23.

Weather Stage						
Level	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
2	1699 (82.9)	346 (16.9)	5 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
Occ 2a	1414 (88.3)	155 (9.7)	6 (0.4)	26 (1.6)	0 (0.0)	0 (0.0)
Occ 2b	423 (71.0)	132 (22.1)	8 (1.3)	33 (5.5)	0 (0.0)	0 (0.0)
3	1155 (78.4)	124 (8.4)	40 (2.7)	154 (10.5)	0 (0.0)	0 (0.0)
Weathering Type						
Level	Abrasion	Cracking	Exfoliation	Pitting	Multiple	None
2	126 (6.1)	105 (5.1)	77 (3.8)	35 (1.7)	8 (0.4)	1699 (82.9)
Occ 2a	2 (0.1)	134 (8.4)	0 (0.0)	39 (2.4)	12 (0.7)	1414 (88.3)
Occ 2b	0 (0.0)	139 (23.3)	0 (0.0)	17 (3.0)	16 (2.7)	423 (71.0)
3	1 (0.1)	206 (14.0)	28 (1.9)	24 (1.6)	59 (4.0)	1155 (78.4)
Bone Modification						
Level	Root	Tooth	Butcher	Calcined	Burned	Raw
2	339 (16.5)	0 (0.0)	0 (0.0)	87 (4.2)	92 (4.5)	1871 (91.3)
Occ 2a	344 (21.5)	1 (0.1)	0 (0.0)	24 (1.5)	83 (5.2)	1494 (93.3)
Occ 2b	147 (24.7)	0 (0.0)	0 (0.0)	9 (1.5)	12 (2.0)	575 (96.5)
3	315 (21.4)	18 (1.2)	4 (0.1)	64 (4.3)	75 (5.1)	1334 (90.6)
Fracture Pattern*						
Level	Complete	Spiral	Irregular	Excavation	Block	
2	4 (0.2)	21 (1.0)	2044 (99.7)	5 (0.2)	54 (2.6)	
Occ 2a	8 (0.5)	33 (2.1)	1589 (99.3)	15 (0.9)	0 (0.0)	
Occ 2b	5 (0.8)	45 (7.6)	587 (98.5)	8 (1.3)	0 (0.0)	
3	14 (1.0)	207 (14.1)	1447 (98.2)	53 (3.6)	21 (1.4)	

* Some specimens have multiple fracture patterns leading to a percentage NISP>100.

Summary and Discussion: Four features were identified in level 2 and the stratigraphic position of at least three of these suggests that they are associated with cultural occupation 2b. Similarities in the lithic composition between feature 6 and the surrounding units may also place the fourth feature within the lower occupation. If the features are indeed associated it is possible to define a clear activity area that appears to be centered around boiling feature 3A.

Artifact distributions by number and weight are provided in Appendix B, Figures B.1 and B.2. The primary activity area is easily distinguished in the southwestern portion of the main block. The pattern of lithic debitage and tools around feature 3A appears to be circular and there is a distinct lack of artifacts in the eastern and northern portions of this excavation block. It is possible that the pattern delineates some form of structure and is reminiscent of the pattern recorded by Brumley (1975:139) at the Cactus Flower site. Faunal specimens and FBR are also common around the cluster of features but a second concentration is also present in the northernmost units of the main block (Block 1E). Few units were excavated in this area and it is difficult to determine activities related to these distributions. Only a single tool and two flakes were recovered from these units.

Whether the distribution is representative of some type of structure or simply an activity area around a central hearth requires future research. Regardless, the relatively large number of expediency tools in association with the boiling pit and flaking debris is indicative of a short-term campsite. The boiling pit may have been used to procure bone grease or to simply cook a meal. Given the lack of culturally impacted bone (many of the fractures are of the dry bone type) the latter explanation may be a better interpretation for the use of this feature. Debris from the flaking station is quite small and extremely numerous and is suggestive of tool finishing and/or rejuvenation. A number of platform rejuvenation flakes (all SRC) associated with feature 5 may indicate the manufacture of several tools. One tool in particular, a wedge fragment (#5177), appears to have been made from the same material.

The dominant lithic materials tend to be from local sources with the exception of material identified as silicified sediment. Many of these pieces resemble Tongue River silicified sediment and hint at a link to the sources in the Tongue River region in the northern United States. Several flakes of Knife River chalcedony were also recorded and can be sourced to the same region. Unfortunately bison remains are too fragmented and too sparse to determine seasonality. At least three, and possibly four, bison are represented but many of the bison elements were found in the northernmost excavation units (within Test Unit 2) where it is currently impossible to separate elements from occupations 2a and 2b. A single bison is associated with the cluster of features that are thought to be a part of the occupation 2b assemblage.

A.2.3 Level 2: Occupation 2a

Artifacts that could be attributed to occupation 2a were identified in 19 of the excavation units. Artifacts range in depth from 40 to 63 centimeters below the ground surface with the deepest artifacts recorded in the easternmost excavation units (see Figure A.8). A radiocarbon date of 3348±50 rcybp (BGS-2363: cal 3830 [3687,3657,3643] 3565) was obtained from a bison radio-ulna.

Features

Feature 1 (Figure A.12): A single feature was recorded in this occupation. Feature 1 is a bone concentration and associated stain. Sediments associated with this feature have a greasy texture. The main faunal concentration is oval in shape and measures 50 cm long by 20 cm wide. Expanding eastwards from the oval (approximately 75 cm) is a light stain with fewer bone fragments and minute flecks of charcoal. The feature is quite thin with top and bottom measurements of 47 and 52 cm below surface. Bone fragments from within the feature were highly comminuted and difficult to collect. Sediment from the feature was water-screened but much of the bone disintegrated during this process. Burned and calcined bone fragments were not recorded within the feature but are present immediately outside the stained area. This feature is interpreted as a spill zone associated with the maintenance of a boiling feature. The bone appears to have been extensively boiled leading to the accelerated deterioration of the specimens after deposition.

Tools

Bifaces (n=3; Table A.8; Figure A.13): One bifacial tool and two bifacial performs were identified in occupation 2a. Catalogue #5077 is a tip fragment made from heat-treated Swan River chert. The left lateral edge is bifacially worked while the right lateral edge is unifacially flaked along much of the margin. The tip of the item is rounded and there is evidence of use wear. The two bifacial performs represent different stages of bifacial reduction. Catalogue #5091 is an early stage preform with minimal flaking along the lateral edges. It is rectangular in shape and retains a large portion of the cortex on the dorsal surface. In the lithic reduction sequence it is the equivalent of an early stage 2 biface with a width to thickness ratio of 2.5 (see Keyser and Fagan 1993 for a discussion of the reduction stages). The second bifacial preform (#5095) represents a later stage of reduction (stage 3) with a width to thickness ratio of 3.1. A transverse fracture has eliminated the tip of the preform resulting in its discard.

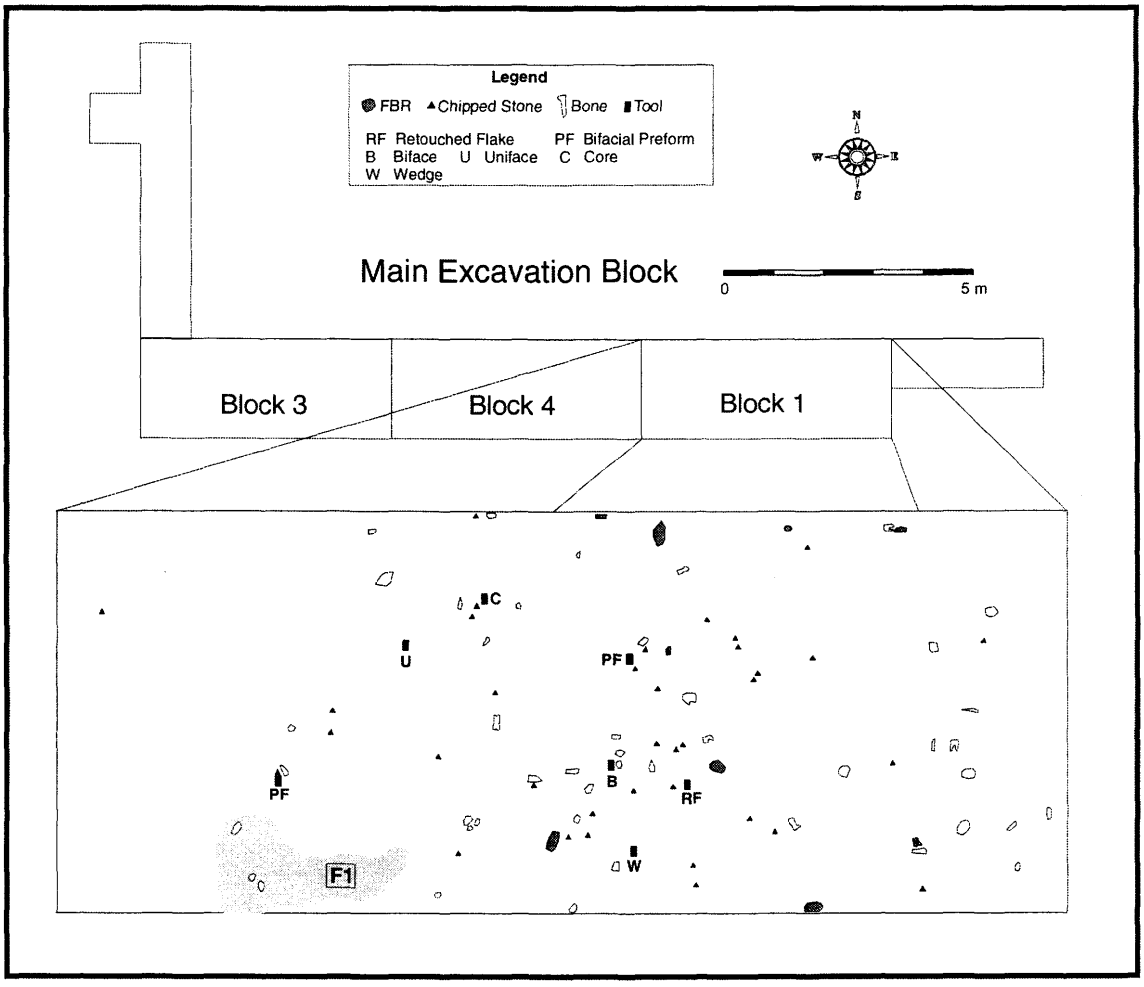

Figure A.12. Partial Planview of Occupation Level 2a.

Table A.8. Occupation Level 2a Stone Tools.

Cat #	Tool Type	Weight (g)	Length (mm)	Width (mm)	Thick (mm)	Material	Figure
5077	Biface	1.6	22	16	5	Swan River Chert	A.13 a
5091	Biface	119.0	86	49	20	Quartzite	A.13 b
5095	Biface	23.0	41	43	14	Swan River Chert	A.13 c
5043	Core	5.4	24	16	11	Swan River Chert	A.14 a
5053	Core	26.1	39	42	21	Silicified Sediment	A.14 b
5158	MURL	0.7	15	10	4	Indet. Chert	A.14 d
5169	MURL	27.7	45	42	11	Quartzite	A.14 c
5192	MURL	0.4	18	17	2	KR Chalcedony	A.14 e
5193	MURL	0.6	15	12	3	Silicified Wood	A.14 f
1474	Projectile Point	1.5	22	15	5	Swan River Chert	A.15 a
5068	Projectile Point	2.6	18	21	7	Swan River Chert	A.15 b
5112	Side Scraper	0.8	17	12	4	KR Chalcedony	A.15 c
5136	Uniface	0.8	13	17	4	KR Chalcedony	A.15 d
5121	Wedge	0.8	13	16	4	Indet. Chert	A.15 e
5125	Wedge	2.7	16	27	7	Indet. Chert	A.15 f

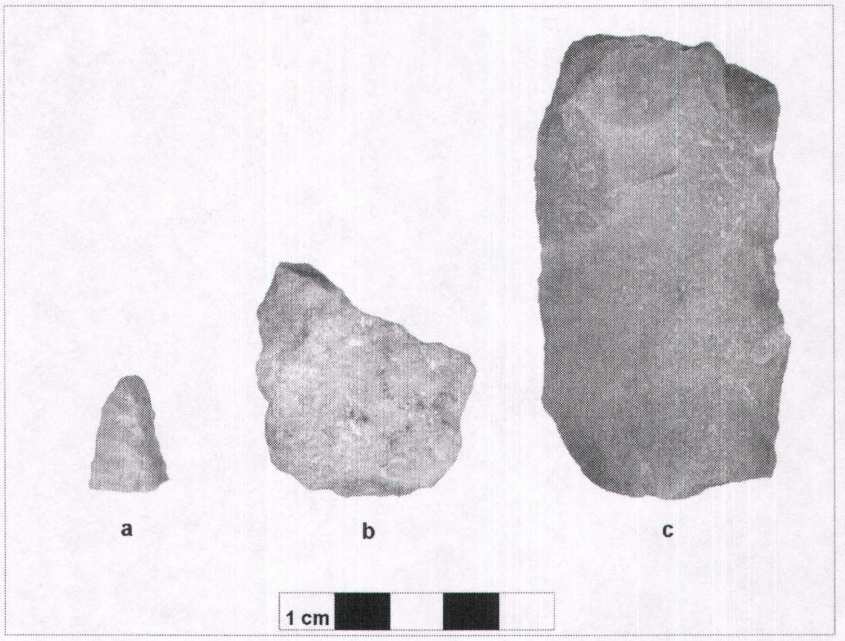

Figure A.13. Bifaces (a-c) from Occupation Level 2a.

Cores (n=2; Table A.8; Figure A.14): Two core fragments were recovered, one comprised of Swan River chert (#5043) and another that resembles Tongue River silicified sediment (#5053). The first is irregular in shape and is possibly a fragment of an exhausted bipolar core. The second is roughly triangular in shape and retains a portion of the cortex on one surface.

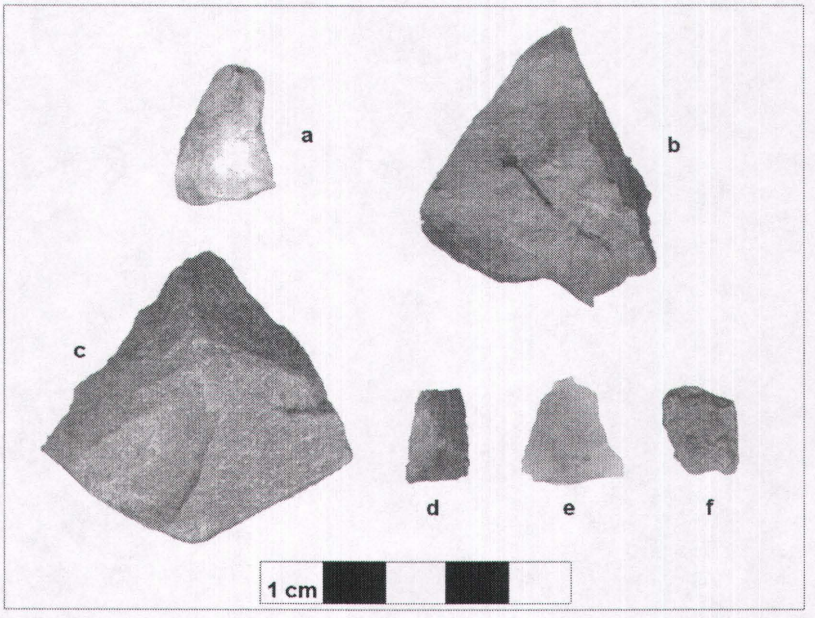

Figure A.14. Core Fragments (a-b) and MURLs (c-f) from Occupation Level 2a.

MURLs (n=4; Table A.8; Figure A.14): All of these specimens exhibit definite edge retouch. Two of the specimens are unifacially retouched along one margin and the remaining two exhibit bifacial retouch along both lateral edges. Catalogue #5158 (Figure A.14:d) is snapped at both the proximal and distal ends and may be a fragment from a crude drill.

Projectile Points (n=2; Table A.8; Figure A.15): Catalogue #1474 is a portion from the base of a Duncan or Hanna projectile point. The point has a long fracture across the face, likely as a result of impact (Figure A.15:a). The base is concave with a broad and shallow notch along the right lateral border. Shouldering is present but is very slight. The point is made from Swan River chert. Catalogue #5068 is the basal portion of a Duncan projectile point and is also constructed from Swan River chert. The point is broken just above the shoulder on the left margin and at the shoulder on the right. Shouldering is extremely slight and the stem is slightly concave along the lateral edges. The base of the point is concave with well-rounded corners.

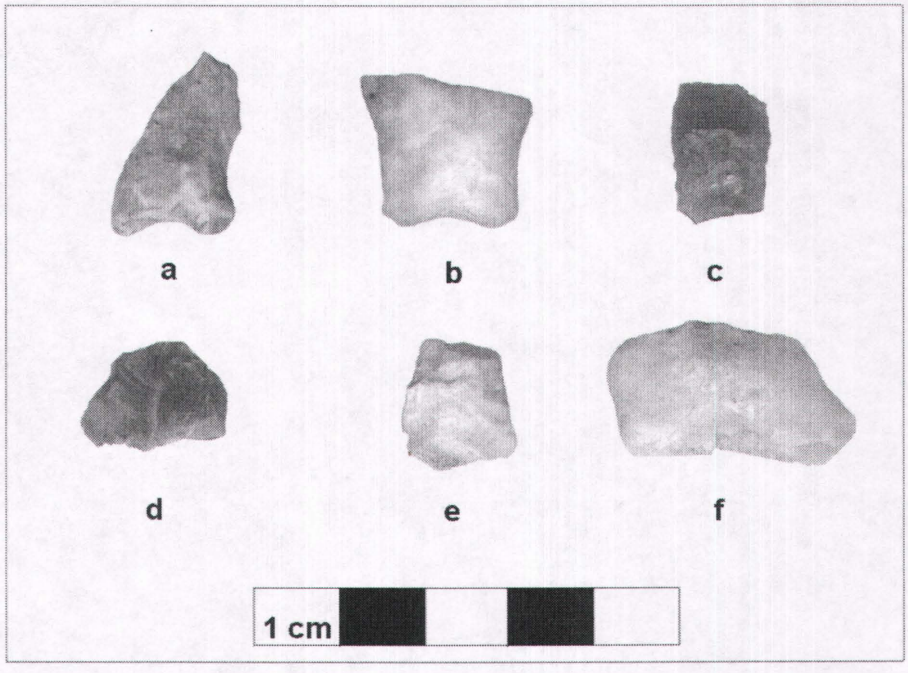

Figure A.15. Projectile Points (a-b), Side Scraper (c), Uniface (d), and Wedges (e-f) from Occupation Level 2a.

Side Scraper (n=1; Table A.8; Figure A.15): Catalogue #5112 is a small side scraper made from Knife River chalcedony. There is steep-angled unifacial retouch along both of the lateral margins with only slight retouch along the distal end.

Uniface (n=1; Table A.8; Figure A.15): This specimen is also made from Knife River chalcedony. It exhibits steep unifacial retouch along the left distal edge. There are several small bifacial fractures along the proximal edge and it is possible that the item was initially an end scraper that was later used as a wedge.

Wedges (n=2; Table A.8; Figure A.15): Two complete wedges were recovered in occupation 2a and both are made from a mottled grey chert. Catalogue #5121 has bifacial battering on both the proximal and distal surface and exhibits heavy utilization. The second specimen (#5125) was reconstructed from separate fragments that were discovered within the same excavation unit. This specimen also exhibits bifacial battering on the proximal and distal surfaces. The proximal end has a distinctly concave appearance but the use wear is consistent with functioning as a wedge rather than a spokeshave. The tool appears to have broken during use and several smaller fragments were not recovered.

Lithic Debitage

A summary of the occupation 2a debitage by material and type is included as Table A.9. Swan River chert is the most commonly utilized lithic material by number (29.7%) followed by quartzite (17.3%), silicified wood (13.3%), chert (11.7%) and silicified sediment (11.3%). With the exception of the silicified sediment all of these materials are easily obtainable although Swan River chert is more common to the northeast. The material identified as silicified sediment is the same as the material identified in level 2 and is tentatively classified as Tongue River silicified sediment (TRSS). The relatively large number of TRSS flakes is surprising but not unbelievable considering that the only other exotic materials (Knife River chalcedony and Montana chert) are also found within the TRSS source region. The presence of all three lithic materials is suggestive of migration or trade relationships with groups living in the Tongue River region of the northern United States.

Quartzite is the most common material by weight (40.7%) followed by Swan River chert (29.7%), silicified sediment (16.5%) and silicified wood (8.1%). Primary and secondary reduction flakes represent almost all of the specimens identified as quartzite (n=43). Conversely, many of the Swan River chert specimens are tertiary re-sharpening and finishing flakes (n=47). In total, secondary and tertiary flakes and flake fragments make up 90.6% of the lithic debitage by number suggesting that primary activities are associated with tool finishing and tool rejuvenation.

Table A.9. Occupation 2a Debitage by Material and Type.

Summary by Material	Number	Weight (grams)	%N	%weight
Brown Chalcedony	18	1.8	6.0	0.5
Chalcedony	8	1.1	2.7	0.3
Crystalline Quartz	1	0.5	0.3	0.1
Feldspathic Siltstone	1	0.5	0.3	0.1
Indet Chert	35	9.2	11.7	2.7
KR Chalcedony	4	1.2	1.3	0.4
Montana Chert	3	0.3	1.0	0.1
Porcellanite	3	0.3	1.0	0.1
Quartzite	52	137.9	17.3	40.7
Silicified Peat	9	1.7	3.0	0.5
Silicified Sediment	34	56.1	11.3	16.5
Silicified Siltstone	3	0.3	1.0	0.1
Silicified Wood	40	27.5	13.3	8.1
Swan River Chert	89	100.6	29.7	29.7
Total	**300**	**339.0**	**99.9**	**99.9**

Summary by Type	Number	Weight	%N	
Bipolar Flake	2	1.8	0.7	
Platform Rejuv Flake	3	8.9	1.0	
Primary Flakes	11	117.6	3.7	
Secondary Flakes	118	180.0	39.3	
Shatter	12	15.3	4.0	
Tertiary Flakes	154	15.4	51.3	
Total	**300**	**339.0**	**100**	

Fire Broken Rock

A total of 248 fragments of fire broken rock weighing 3185.8 grams have been recovered from occupation 2a. Igneous and metamorphic rock types dominate the assemblage (n=185; 2119.3 grams). Sedimentary rock is represented in limited quantities and includes both quartzite (n=28; 493.5 grams) and sandstone (n=18; 353.3 grams). The majority of the specimens (n=227) exhibit water fractures typically produced by stone boiling and although no boiling pit was identified materials from feature 1 also appear to be related to this type of activity.

Faunal Assemblage

The faunal assemblage from occupation 2a consists of 1602 specimens weighing 1918.8 grams. Two species are represented (*Bison bison* and *Thomomys talpoides*) as well as numerous specimens that could not be identified further than large Artiodactyl:

Bison bison (NISP=54, MNE=24, MNI=1): petrous, two maxillary molars, indeterminate molar, two distal radii, two proximal ulnae, 5th metacarpal, two internal carpals, radial carpal, two ulnar carpals, first phalanx, four second phalanges, third phalanx, distal tibia, distal calcaneus, astragalus. The most common element is the second phalanx and all but one are complete. The recovered specimens represent one animal and measurements of a distal radius suggest that it is a mature male. Immature individuals were not identified and there are no socketed teeth and as a result the season of occupation is difficult to infer.

Thomomys talpoides (NISP=1, MNE=1, MNI=1): proximal mandible. This specimen is stained suggesting an extended period of burial. It is possible that the specimen represents part of the background fauna associated with occupation 2a. It is not believed to have been deposited as a result of cultural activity.

Large Artiodactyl (SC6) (NISP=166): tooth enamel (105), longbone fragments (48), rib fragments (2), vertebral fragments (1), indeterminate molar fragments (6), and an indeterminate incisor/canine (4). These specimens are most likely from a bison.

A total of 10.1% (n=161) of the specimens from occupation level 2a exhibit early stage weathering with cracking and pitting representing the most common weathering type (Table A.7). Moderate weathering (stage 3) was recorded on 1.6% of the specimens (n=26) consisting primarily of longer and deeper crack lines. Heavy weathering was not recorded.

The percentage NISP of rootlet etching is quite high (21.5%) and small masses of rootlets were recorded on several bone fragments. These have undoubtedly played a role in erasing evidence of other bone modifications. One distal radius displayed several furrows and minor pitting as a result of carnivore chewing. Continued chewing of the broken end has resulted in a slight hollowing of the marrow cavity. No evidence of butchery was recorded on specimens from occupation 2a. Calcined and burned specimens account for 6.7% (n=107) of the NISP and many of these were recovered in units surrounding Feature 1.

Summary and Discussion: A single feature was identified in occupation level 2a. Soil in this feature was greasy and contained hundreds of comminuted raw bone fragments. The shallow depth, size and shape of the feature are indicative of a spill area associated with the maintenance of a boiling pit. Artifacts are clearly distributed around Feature 1 (Appendix B, Figures B.3 and B.4). The largest concentrations of faunal material, debitage and fire broken rock are all located in units immediately north and east of feature 1. Artifacts from occupation 2a are relatively rare in the central block of the main excavation (Block 4) lending further weight to the argument that many of the artifacts from Level 2 are associated with occupation 2b rather than 2a.

Primary activities appear to be focused around the use and maintenance of a stone boiling pit. Small secondary and tertiary flakes also indicate end stage tool manufacture and/or tool rejuvenation. Lithic materials are predominantly local but the presence of Tongue River silicified sediment, Knife River chalcedony and Montana chert indicate continued ties to the Plains region surrounding the Tongue River.

The identified faunal assemblage indicates the presence of a single bison. Specimens are too fragmented and too few in number to provide a definitive age and as a result the season of occupation cannot be inferred. Measurements from one radius suggest that the individual was a mature male.

Once again the identified assemblage is indicative of a short-term campsite occupied by a small number of individuals, perhaps a family unit.

A.2.4 Level 2: Occupation 2b

Occupation 2b was also identified in 19 of the main block excavation units. In the eastern units it is represented by a thin paleosol approximately 3 centimeters wide with artifact depths that range between 52 and 69 centimeters below the ground surface (Figure A.8). A calculated AMS date of 3430±40 rcybp (Beta-167310; cal 3894 [3828, 3788, 3778,3734,3734] 3652) was obtained from a bison lateral malleolus associated with the middle of the paleosol in one of the easternmost excavation units. This date is nearly identical in age to the date of 3440±55 rcybp (BGS-2364: cal 3977 [3785] 3644) obtained from Feature 3A in level 2.

Features

No features were identified in occupation 2b. The artifact assemblage from the eastern excavation units is sparse with little patterning (Figure A.16). The features from Level 2 are believed to be a part of the occupation 2b assemblage.

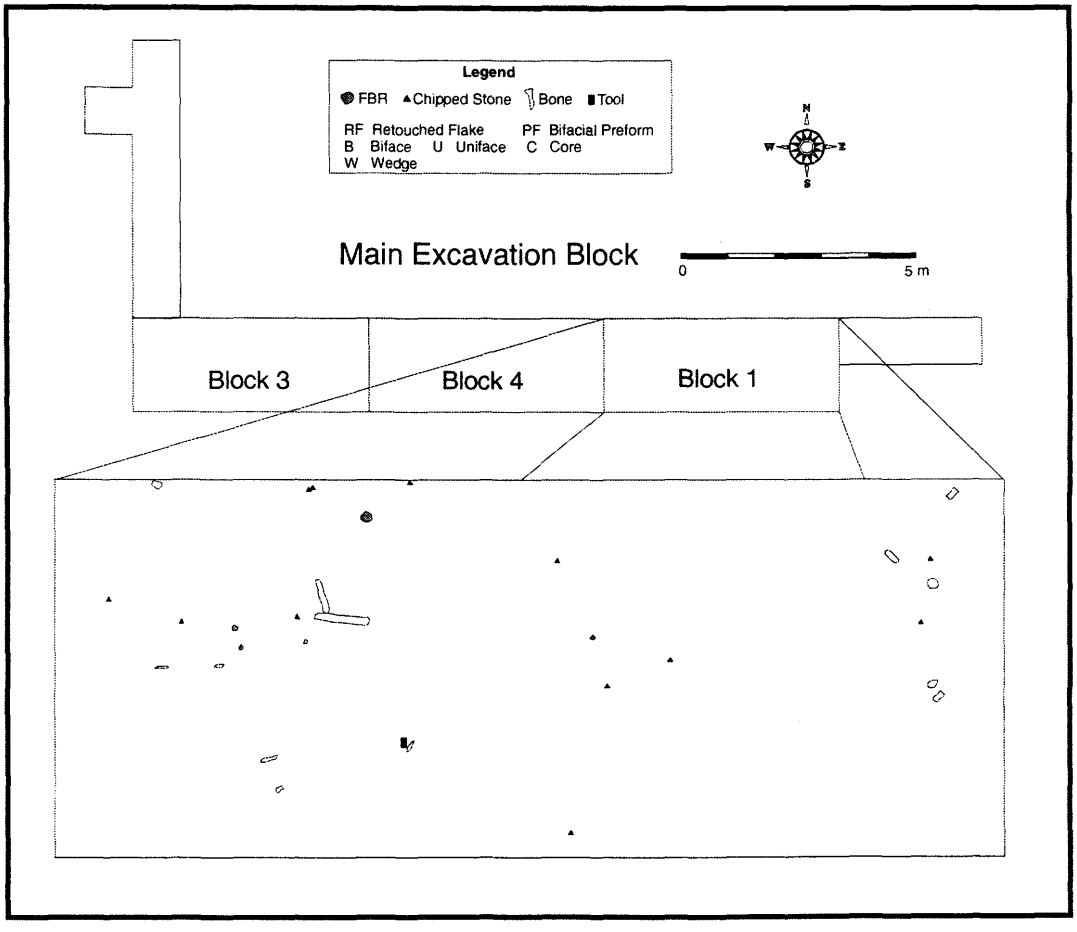

Figure A.16. Partial Planview of Occupation Level 2b.

Tools

MURLs (n=4; Table A.10; Figure A.17): Four retouched flakes were recovered from the level 2b assemblage. Two of the specimens are made from Swan River chert and the other two from silicified peat. All of the specimens exhibit unifacial retouch along one or both margins. Catalogue #5184 (Figure A.17:c) exhibits retouch within a small concavity as well as on a small lateral projection. This item may have been used as a spokeshave or graver. The remaining items could have functioned effectively as simple scraping or cutting tools.

Table A.10. Occupation Level 2b Stone Tools.

Cat #	Tool Type	Weight (g)	Length (mm)	Width (mm)	Thick (mm)	Material	Figure
5159	MURL	2.1	19	17	5	Swan River Chert	A.17 a
5164	MURL	6.4	29	26	7	Silicified Peat	A.17 b
5184	MURL	2.4	26	18	5	Silicified Peat	A.17 c
5188	MURL	3.7	29	18	8	Swan River Chert	A.17 d
5105	Side Scraper	1.4	14	15	5	Indet. Chert	A.17 e
5122	Wedge	1.2	18	13	5	KR Chalcedony	A.17 f

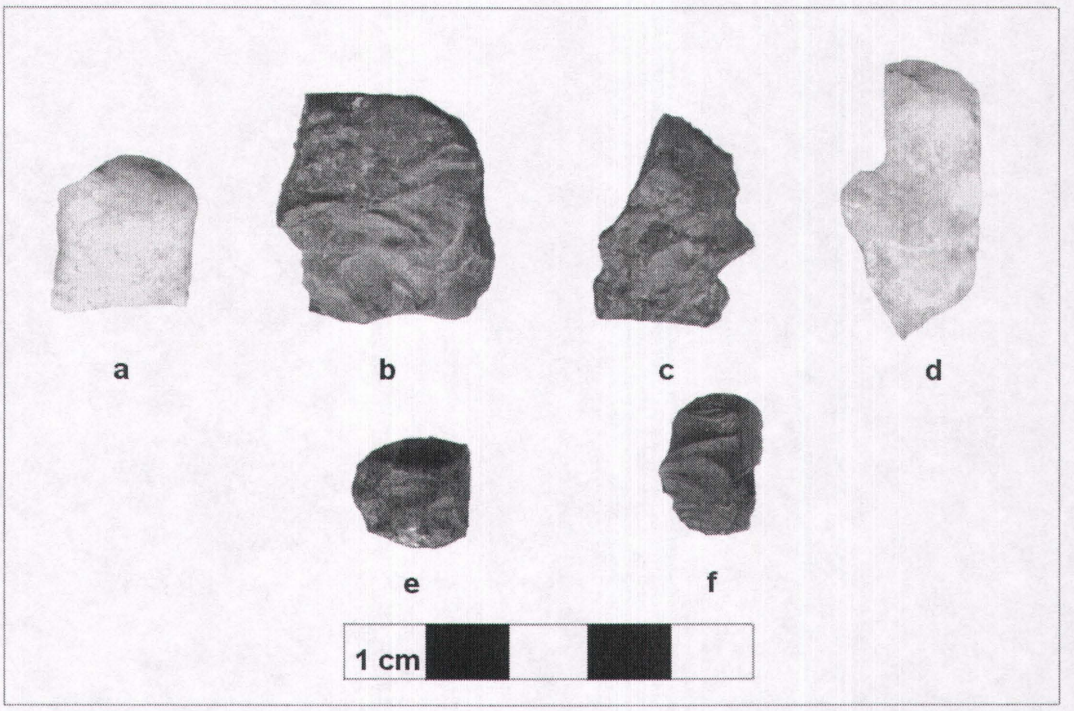

Figure A.17. MURLs (a-d), Side Scraper (e) and Wedge (f) from Occupation Level 2b.

Side Scraper (n=1; Table A.10; Figure A.17): This specimen has unifacial retouch along all of the margins. Retouch is steepest along the right lateral edge forming the major working surface. Heavy use wear is also evident along the main working edge. This item is made from a grey chert.

Wedge (n=1; Table A.10; Figure A.17): Catalogue # 5122 is a small wedge made from Knife River chalcedony. There is evidence of bifacial battering along the proximal and distal ends, though it appears that the item saw minimal use.

Lithic Debitage

The chipped stone debris from occupation 2b is summarized in Table A.11. Chert is the most dominant lithic material by number (28.2%) but forms a minimal portion of the lithic assemblage by weight (5.1%). Swan River chert, silicified sediment (likely TRSS), silicified wood and quartzite are also common. Interestingly four quartzose flakes were identified in occupation 2b. Similar flakes were identified in the Level 2 assemblage but are not present in occupation 2a.

Table A.11. Occupation Level 2b Debitage by Material and Type.

Summary by Material	Number	Weight (grams)	%N	%weight
Brown Chalcedony	7	1.5	2.7	0.5
Chalcedony	2	0.2	0.8	0.1
Crystalline Quartz	1	0.2	0.4	0.1
Indet Chert	73	16.2	28.2	5.1
KR Chalcedony	2	0.7	0.8	0.2
Quartzite	32	130.9	12.4	40.8
Quartzose	4	43.9	1.5	13.7
Shale	1	0.1	0.4	<0.1
Silicified Peat	6	2.9	2.3	0.9
Silicified Sediment	42	29.0	16.2	9.0
Silicified Wood	38	43.9	14.7	13.7
Swan River Chert	51	51.2	19.7	16.0
Total	**259**	**320.7**	**100.1**	**100.1**

Summary by Type	Number	Weight	%N	
Bipolar Flake	4	5.6	1.5	
Platform Rejuv Flake	7	33.5	2.7	
Primary Flakes	6	63.3	2.3	
Secondary Flakes	126	166.4	48.6	
Shatter	20	42.3	7.7	
Tertiary Flakes	96	9.6	37.1	
Total	**259**	**320.7**	**99.9**	

Secondary flakes are the most numerous of the chipped debris categories (48.6%). Many of these are large (between 2.5-5 cm) and represent bifacial thinning flakes. Tertiary flakes are numerous as well (37.1%) and also hint at bifacial reduction and tool finishing. Platform rejuvenation flakes are represented by three different lithic materials (silicified sediment, quartzite and chert) suggesting the use of several different cores; however, tools of this type were not recovered during excavation.

Fire Broken Rock

A sum of 66 fire broken rock fragments were recovered with a total weight of 1879.9 grams. Many of these specimens (n=37) are identified as igneous or metamorphic in nature comprised mainly of granite and gneiss. Quartzite (n=13), sandstone (n=13) and hard cobble specimens (n=3) were also recorded. Many of the fractures appear to have resulted from immersion in water (n=50; 75.8%) and have been produced by activities related to stone boiling.

Faunal Assemblage

The faunal assemblage from level 2b consists of 596 specimens weighing 1120.6 grams. *Bison bison* is the only species identified in this assemblage. A number of specimens identified as a large artiodactyl are also thought to represent these individuals.

Bison bison, NISP=110, MNE=18, MNI=2: three maxillary molars, P^2, scapula blade, two distal radii, proximal ulna, internal carpal, unciform carpal, fused 2/3 carpal, proximal metacarpal, four second phalanges, proximal femur, patella. Based on the distal radii at least two individuals are represented. All of the specimens appear to represent mature animals providing little evidence to determine approximate season of occupation.

Large Artiodactyl (SC6), NISP=93: tooth enamel (36), longbone fragments (24), rib fragments (33). These specimens are similar in size and morphology to bison but lack definitive characteristics needed for species identification.

Early stage weathering is relatively high compared to the other assemblages (n=140; 23.4%; see Table A.7). Moderate weathering (stage 3) becomes more significant in the lower occupations and is expressed in level 2b by longer and deeper crack lines. Heavy weathering was not recorded. Rootlet etching is also relatively

common (24.7%) related to an increase in silt at depth. Water retention is greater in these levels leading to a perceptible increase in the size of the root mass. Many of the smaller specimens were completely surrounded by roots and not surprisingly tooth marks and evidence for butchery is absent. Calcined and burned specimens are rare (n=21) but do appear to be concentrated at the eastern end of block 1. Spiral fractures are common on longbone fragments hinting at the breakage of limb elements to retrieve nutrient rich bone marrow.

Summary and Discussion: The exact nature of the occupation 2b assemblage is difficult to assess. No visible features were identified and tools are rare. The associated lithic debitage suggests that secondary biface reduction and tool manufacture may be the primary activity. The presence of a wedge, multiple spirally fractured long bones and numerous water fractured pieces of FBR also indicate processing of bison limb elements for nutrient rich marrow and bone grease.

Faunal and lithic distribution patterns (Appendix B, Figures 5 and 6) are of limited value due to the small assemblage that was recovered in occupation 2b. Still, there does appear to be a concentration of fire broken rock and faunal specimens in the middle of the main block (block 4) with few artifacts in the easternmost excavation units. It is possible that the artifacts from occupation 2b represent peripheral activities associated with the feature cluster from Level 2. Similarities in the composition of the lithic assemblage, overall artifact depth and radiocarbon dates also support this assumption.

A.3.5 Cultural Level 3

Artifacts from cultural level 3 were relatively easy to separate from level 2. In the western end of the main block the materials from levels 2 and 3 were located within one large paleosol; however, artifacts remained in distinct levels separated by a small inclusion of sterile soil. In the eastern units artifacts are associated with the upper portion of a separate and distinct paleosol (approximately 10 centimeters wide) that ranges in depth from between 71 to 87 centimeters below the surface (Figure A.8). A radiocarbon date of 4140±60 rcybp (Beta-183521; cal 4872 [4831] 4575) was obtained from a sample of bison bone in Block 1 (the eastern end of the main excavation block). A McKean Lanceolate point was also recovered in this occupation (Table A.4).

Features

Feature 2 (Figure A.18): This feature consists of a small concentration of fire broken rock and lithic debitage. There is no significant change in the colour of the soil associated with this feature and no pit was observed. A total of 38 fragments of fire broken rock were identified in the cluster weighing 1500.8 grams. Both thermal stress and bedding fractures were noted on the specimens. A number of flakes were also recovered and consist primarily of quartzite and Swan River chert. The feature is approximately 60 cm long and 50 cm wide. A small crystalline quartz core fragment and several bone fragments were also present. This scatter of artifacts may represent a spill area related to hearth maintenance.

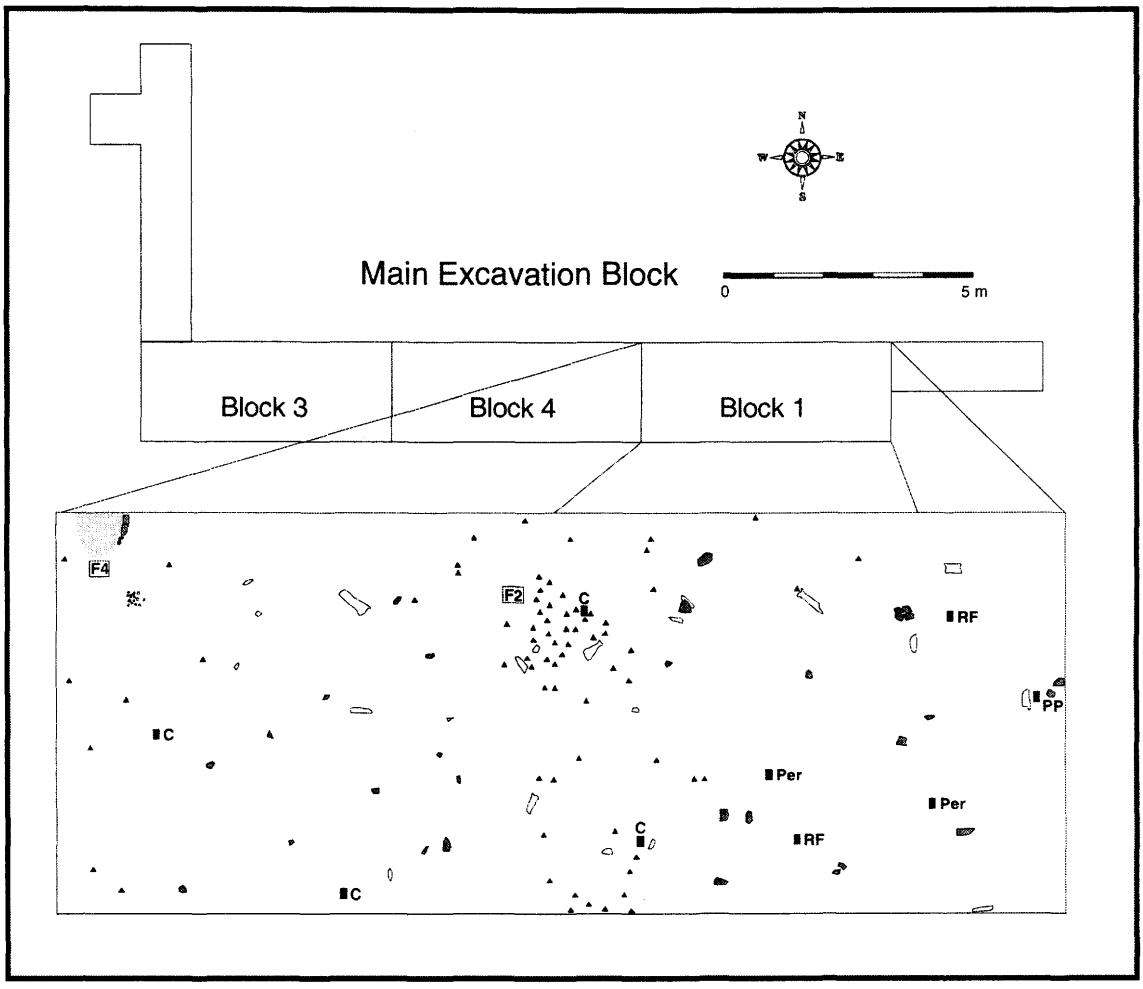

Figure A.18. Partial Planview of Level 3.

Feature 4 (Figure A.18): Feature 4 is a small basin-shaped hearth that was located in unit 265N 193E. It appears that approximately half of the feature was excavated. The exposed area was 22 cm long and 27 cm wide. The soil in the hearth was slightly stained and contained small flecks of charcoal and ash. Minor discoloration of the soil below the feature was noted and suggests limited use or low temperatures within the hearth. The feature was partially lined by fire broken rock and five pieces were removed from the eastern edge with a combined weight of 248.3 grams. Another large fragment was noted in the wall of the excavation unit.

Tools

Bifaces (n=7; Table A.12; Figure A.19): Three bifacial tools and four bifacial performs have been identified in occupation 3. Catalogue #5076 and #5080 are well finished and may represent the ends of broken projectile points. The first (Figure A.19:a) is constructed from Knife River chalcedony and has a broad triangular shape. The second (Figure A.19:c) is made from a heavily patinated chert. A small hinge fracture on the left lateral edge mirrors the appearance of a notch; however, the right side does appear to have had a slight indentation. The last bifacial tool, specimen #5078, appears to be a reworked projectile point. The right lateral edge has been extensively retouched leaving a steep angled edge. The item may have been used as a perforator or drill.

Catalogue #5089 is a fragment from an early stage preform (stage 2) made from basalt. There is a large fracture on the right lateral edge that likely resulted in the discard of this item. Catalogue #5090 is a complete stage 2 preform with a width to thickness ratio of 3.4 (Figure A.19:d). The artifact is made from Swan River chert and there is a flaw in the material along the lateral edge making further attempts at thinning extremely difficult. Use wear is not evident and it appears that the tool was discarded during manufacture. The remaining two artifacts are preform fragments made from a fine-grained chert. Both of these items have cortex flaws that could not be removed. Use wear is evident along the lateral edge of both specimens suggesting later use as expediency tools. Catalogue #5094 has unifacial retouch along one margin and may have been used as a scraping tool. The second fragment (#5096) does not exhibit retouch and may have been used as a cutting tool.

Table A.12. Level 3 Stone Tools.

Cat #	Tool Type	Weight (g)	Length (mm)	Width (mm)	Thick (mm)	Material	Figure
5076	Biface	1.3	16	22	4	KR Chalcedony	A.19 a
5078	Biface	0.9	20	12	4	Silicified Peat	A.19 b
5080	Biface	1.2	19	17	4	Indet. Chert	A.19 c
5089	Biface	53.8	68	41	17	Basalt	A.19 e
5090	Biface	14.8	49	31	9	Swan River Chert	A.19 d
5094	Biface	4.2	20	25	8	Montana Chert	
5096	Biface	5.8	41	27	6	Indet. Chert	A.19 f
5042	Core	189.0	82	69	34	Quartzite	A.20 a
5044	Core	41.6	39	55	20	Basalt	
5045	Core	109.0	63	56	26	Swan River Chert	A.20 b
5046	Core	6.7	28	21	12	Crystalline Quartz	
5051	Core	9.4	35	18	14	Crystalline Quartz	A.20 d
5052	Core	7.6	27	17	16	Crystalline Quartz	
5054	Core	13.2	35	24	16	Crystalline Quartz	A.20 e
5055	Core	196.0	81	58	38	Quartzite	
5056	Core	62.4	53	54	19	Crystalline Quartz	A.20 c
5057	Core	33.4	36	34	30	Swan River Chert	A.20 f
5107-08	Endscraper	2.3	26	18	3	Indet. Chert	A.21 a
5113	Endscraper	1.5	18	14	7	Brown Chalcedony	A.21 b
5114	Endscraper	2.0	17	19	6	Indet. Chert	A.21 c
5115	Endscraper	3.4	29	18	7	Silicified Peat	A.21 d
5116	Endscraper	4.9	32	19	7	Indet. Chert	A.21 e
5138	Hammerstone	36.0	49	25	20	Quartzite	A.21 f
5156	MURL	1.3	28	14	4	Silicified Peat	
5160	MURL	2.0	25	19	5	Swan River Chert	
5162	MURL	1.9	25	21	5	Indet. Chert	A.22 a
5163	MURL	1.7	19	19	5	Silicified Wood	
5165	MURL	0.2	9	10	2	Indet. Chert	
5166	MURL	1.3	23	16	3	Gronlid Siltstone	
5167	MURL	4.0	24	17	11	Indet. Chert	A.22 b
5170	MURL	6.9	37	22	8	Quartzite	A.22 c
5171	MURL	0.2	16	9	2	Indet. Chert	
5172	MURL	0.2	11	10	2	Silicified Peat	
5186	MURL	0.5	14	12	3	Indet. Chert	A.22 d
5187	MURL	2.0	19	27	4	Gronlid Siltstone	
5189	MURL	0.3	11	13	3	Chalcedony	A.22 e
5190	MURL	6.1	39	25	7	Indet. Chert	A.22 f
5191	MURL	0.2	10	15	2	Silicified Wood	
5194	MURL	6.3	33	31	6	Swan River Chert	A.22 g
5195	MURL	2.6	25	23	4	Swan River Chert	A.22 h
5196	MURL	78.3	71	50	16	Quartzite	A.22 i
5197	MURL	1.3	19	16	5	Indet. Chert	
5200	MURL	11.9	39	28	12	Swan River Chert	
5132	Perforator	2.5	38	13	7	Montana Chert	A.23 a
5133	Perforator	3.1	25	26	6	Swan River Chert	A.23 b
5063	Projectile Point	0.4	8	15	3	Chalcedony	A.23 c
5065	Projectile Point	2.7	27	20	5	Silicified Wood	A.23 d
5134	Spokeshave	1.9	24	14	7	Indet. Chert	A.23 e
5208	Spokeshave	2.9	21	18	7	Indet. Chert	A.23 f
5119	Wedge	3.2	22	19	8	Indet. Chert	A.23 g
5120	Wedge	0.7	11	10	5	Swan River Chert	
5123	Wedge	5.1	22	26	8	Swan River Chert	A.23 h
5126	Wedge	1.8	17	16	6	Swan River Chert	A.23 i
5127	Wedge	1.1	13	14	6	Crystalline Quartz	

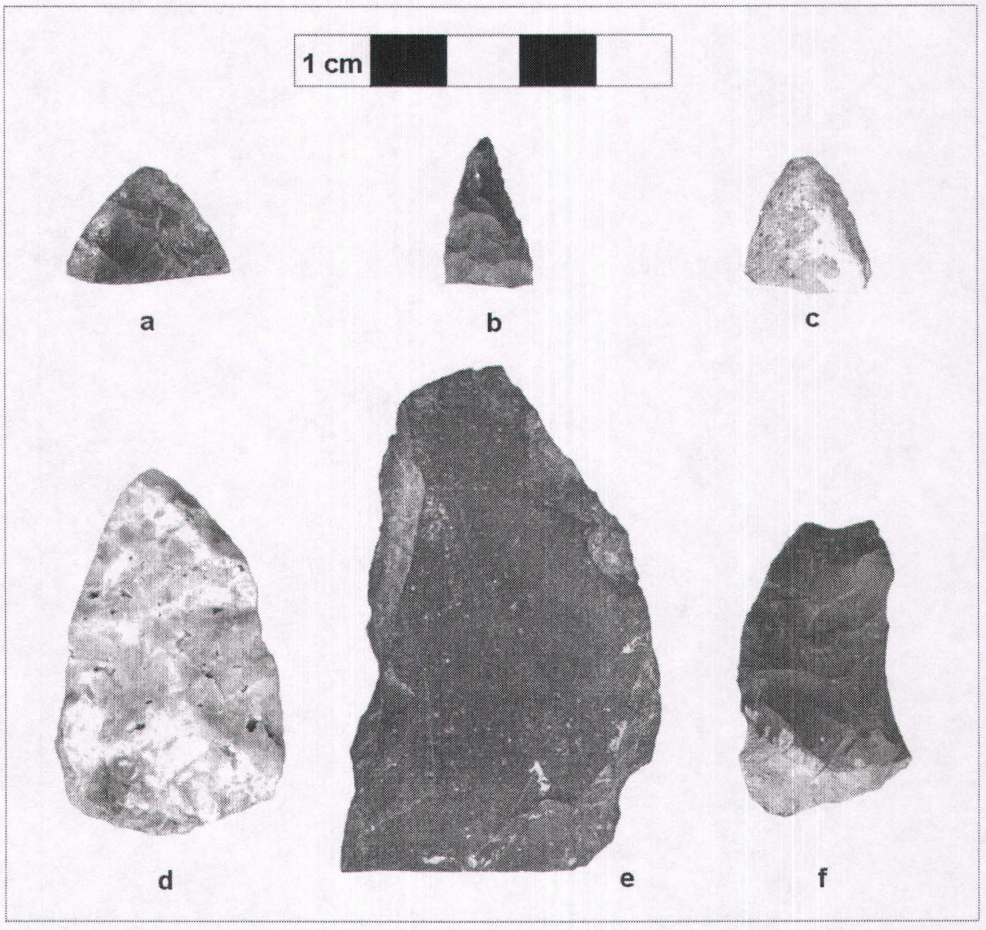

Figure A.19. Select Bifacial Tools and Preforms (a-f) from Level 3.

Cores (n=10; Table A.12; Figure A.20): All but one of the cores and core fragments from occupation 3 are multi-directional flake cores. Two of these (#5045 and 5057) are exhausted and have been discarded. Core fragments represent four more and all are made from crystalline quartz. Catalogue #5042 is a large multi-directional quartzite core that shows numerous failed flake scars contributing to its eventual discard. A single bipolar core (catalogue #5051) was also recovered and is made of crystalline quartz. All of the cores were found in the eastern excavation units and most are from Block 1. Three of the cores (#5055, #5056 and #5057) were discovered in the same excavation unit (265N 199E, Block 1E) at the extreme eastern end of the excavation.

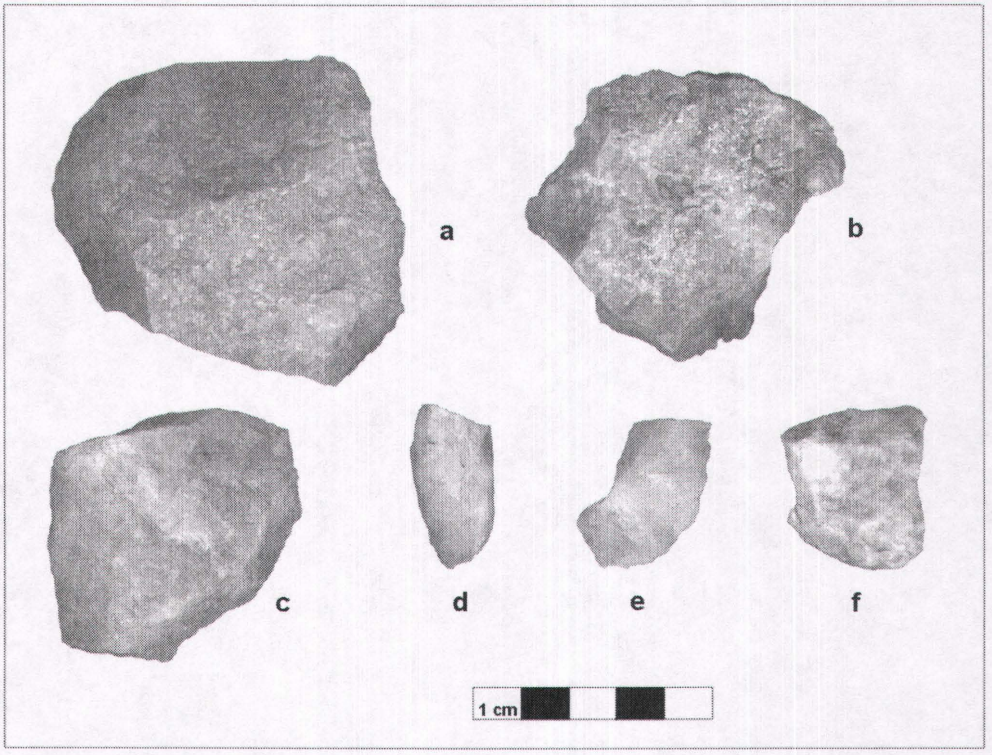

Figure A.20. Select Cores (a-f) from Level 3.

Endscrapers (n=5; Table A.12; Figure A.21): Catalogue #5113 is a triangular endscraper made from brown chalcedony. There is steep unifacial retouch along the distal end and very light unifacial battering on the right lateral edge. The left lateral edge has not been modified. The remaining specimens are combination end and side scrapers. Two are roughly rectangular and two are triangular. One of the specimens (#5107-08) was refit from fragments excavated in adjacent units at the western end of the main block. The remaining scrapers were all found within a tight radius between features 2 and 4.

Hammerstone (n=1; Table A.12; Figure A.21): Artifact #5138 is a small hammerstone with evidence of battering on both the proximal and distal ends. It is constructed from an un-modified quartzite cobble. Battering is limited to a small area approximately 6 mm wide on both ends but is well-defined suggesting extensive use.

MURLs (n=20; Table A.12; Figure A.22): One of the MURLs is identified as a utilized flake and the rest exhibit edge retouch. Of the remaining 19, nine are unifacially flaked along one lateral margin and the remaining specimens are flaked along two edges. Bifacial retouch was absent on the identified specimens.

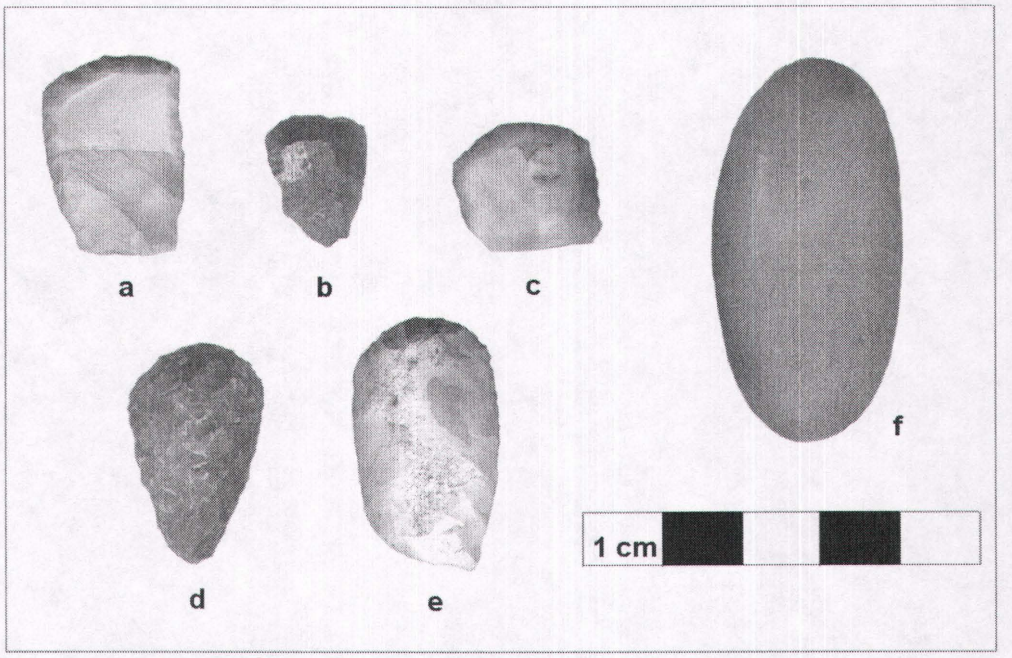

Figure A.21. Endscrapers (a-e) and a Hammerstone (f) from Level 3.

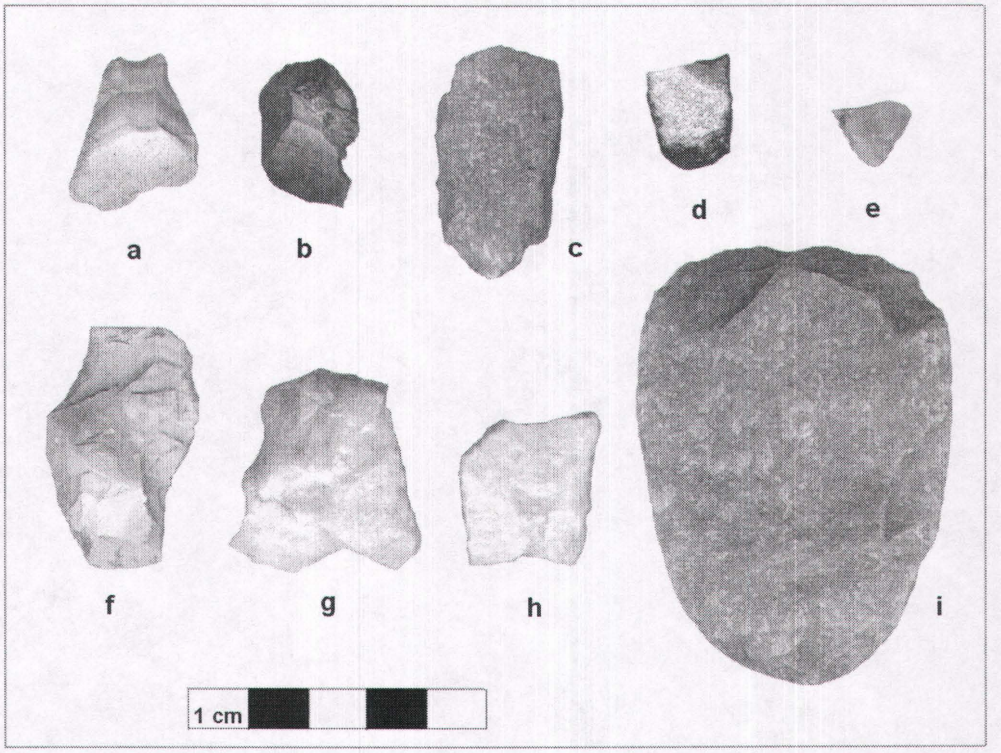

Figure A.22. Select MURLs (a-i) from Level 3.

Catalogue #5167 (Figure A.22:b) exhibits steep retouch along the distal end and may represent an endscraper preform. The distal end of specimen #5186 has been retouched into a sharp point that may have functioned as a graver. Catalogue #5189 (Figure A.22:e) is also pointed but the overall symmetry and shape (plano-convex in cross section) suggest that the specimen is the basal portion of an endscraper. The largest of the retouched flakes is constructed from a quartzite spall (#5196; Figure A.22:i). This specimen exhibits extensive unifacial retouch along the convex distal end and was likely used as a scraping tool. Small and thin retouched flakes represent the remaining MURLs. Retouch is generally limited to a straight edge that could have functioned as either a scraping or cutting surface. Chert (including Swan River chert) is clearly the most dominant of the lithic types used to construct MURLs.

Perforators (n=2; Table A.12; Figure A.23): Catalogue #5132 (Figure A.23:a) has well patterned unifacial retouch along the distal end. The proximal two-thirds of the tool have not been worked. The item is triangular in cross section and is made from Montana chert. A second perforator (#5133; Figure A.23:b) is less steeply angled and constructed from heat-treated Swan River chert. As with the previous specimen, only the working edge of the tool has been flaked. There is evidence of wear along both lateral edges and the tip has been slightly rounded.

Projectile Points (n=2; Table A.12; Figure A.23): One complete and one fragmented projectile point have been recovered from occupation 3. The broken point (#5063; Figure A.23:c) is side-notched and the break runs diagonally from the shoulder on the left lateral margin to just above the shoulder on the right. This specimen is best described as a flake point and is made from a small secondary flake of grey chalcedony. The slightly convex base has been shaped entirely by unifacial retouch while the lateral margins and notches show a minimal amount of bifacial retouch. Given the fact that the point has been shaped from a small flake it is difficult to classify. It is relatively small and is more typical of an arrow tip rather than an atlatl point. Stylistically it is similar to Besant series projectile points and may have been redeposited as a result of rodent activity. Excavation notes from this level record the presence of a considerable amount of mottled clay and gray silty sand associated with several rodent burrows. Mottled clay was encountered in levels below occupation 3 while gray silty sand was typical in the plow zone.

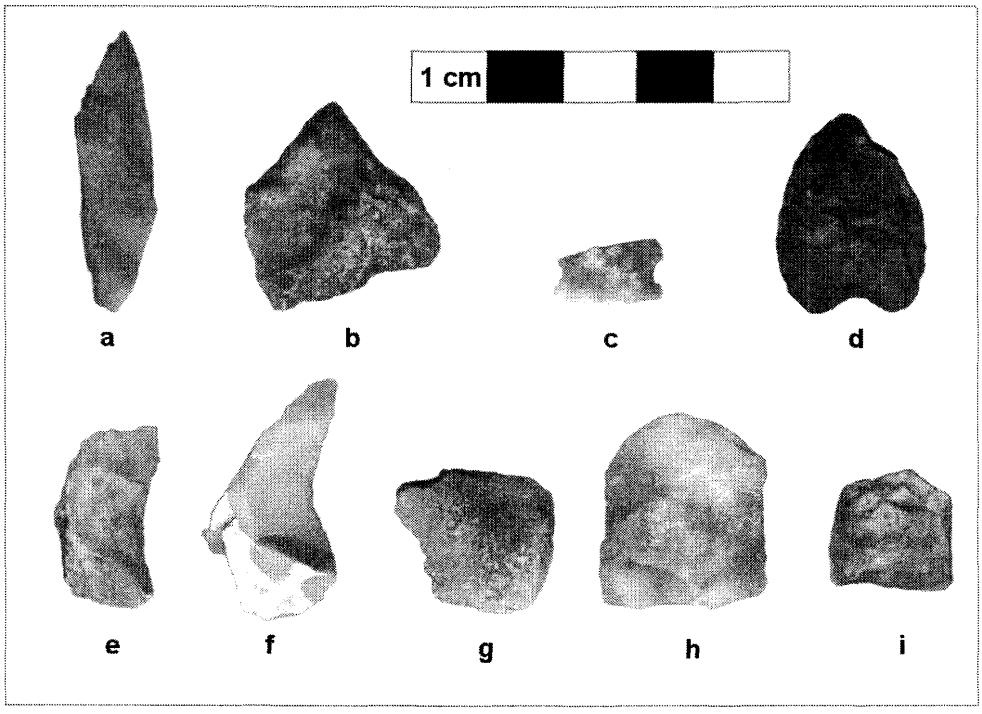

Figure A.23. Perforators (a-b), Projectile Points (c-d), Spokeshaves (e-f) and Wedges (g-l) from Level 3.

Catalogue #5065 (Figure A.23:d) is a re-worked McKean Lanceolate point made from silicified wood. The point is slightly asymmetric due to re-shaping of the right lateral edge. Evidence of a large hinge fracture is present on the right margin and attempts at reshaping the point have been successful with the exception of a small notch near the tip of the point. Reshaping has also led to an exaggeration of the lateral edge convexity. The concave base exhibits well-rounded corners with no evidence of basal grinding.

Spokeshaves (n=2; Table A.12; Figure A.23): Two spokeshaves have been identified in the occupation 3 assemblage although several of the MURLs (see Figure A.22:f and 2.22:g) may have also been used as spokeshaves. The first specimen (#5134) exhibits heavy use wear along the entire concave surface. Continued use and retouch has resulted in a steeply angled working edge. The rest of the flake is un-worked. Catalogue #5208 reveals slight retouch along the concave face and exhibits only minor use wear. Both of these specimens are made from gray chert.

Wedges (n=5; Table A.12; Figure A.23): All of the wedges are roughly rectangular in shape and exhibit moderate to heavy battering along the margins of the tool. With the exception of catalogue #5127 all of the specimens are made from chert

and three of these are clearly Swan River chert. The smallest specimens (#5120, #5126 and #5127) appear to have been broken, re-shaped and re-used multiple times.

Lithic Debitage

A total of 452 pieces of chipped stone debitage weighing 813.5 grams was recovered in level 3 (Table A.13). Quartzite represents the most common lithic material by both number and weight followed to a lesser extent by Swan River chert, silicified wood, and indeterminate chert. These same materials were also used to make 31 of the 54 tools identified in the level although Swan River chert and other chert varieties were more commonly used than quartzite. Crystalline quartz seems under-represented given the fact that five of the ten cores were made of this material.

Table A.13. Level 3 Debitage by Material and Type.

Summary by Material	Number	Weight (grams)	%N	%weight
Andesite	6	59.9	1.3	7.4
Argillite	1	0.5	0.2	0.1
Basalt	1	3.1	0.2	0.4
Brown Chalcedony	9	2.1	2.0	0.3
Cathead Chert	1	4.1	0.2	0.5
Chalcedony	8	1.0	1.8	0.1
Crystalline Quartz	17	13.0	3.8	1.6
Feldspathic Siltstone	9	15.5	2.0	1.9
Granite	1	42.0	0.2	5.2
Indet Chert	29	21.9	6.4	2.7
KR Chalcedony	2	0.4	0.4	<0.1
Porcellanite	2	4.2	0.4	0.5
Quartzose	16	23.5	3.5	2.9
Quartzite	195	405.2	43.1	49.8
Silicified Peat	14	14.5	3.1	1.8
Silicified Sediment	15	15.2	3.3	1.9
Silicified Siltstone	2	1.8	0.4	0.2
Silicified Wood	37	45.4	8.2	5.6
Swan River Chert	87	140.2	19.3	17.2
Total	**452**	**813.5**	**99.8**	**100.1**

Summary by Type	Number	Weight	%N	
Bipolar Flake	1	0.8	0.2	
Platform Rejuv Flake	27	159.7	6.0	
Primary Flakes	31	191.8	6.9	
Secondary Flakes	326	440.7	72.1	
Shatter	19	15.7	4.2	
Tertiary Flakes	48	4.8	10.6	
Total	**452**	**813.5**	**100**	

Secondary flakes are the most numerous of the debitage types (72.1%), a much higher percentage than recorded in the other assemblages. Similarly the percentages of shatter, primary flakes and platform rejuvenation flakes are also higher. Cores were relatively common in this assemblage and it appears that the primary production and reduction of flakes has created much of the occupation 3 debitage.

Fire Broken Rock

Fragments of fire broken rock were relatively numerous with 475 identified specimens. Many of these are hard cobbles that reveal minor evidence of fire fractures. Igneous and metamorphic lithic materials dominate but quartzite and sandstone are also common. The specimens have a total weight of 8143.0 grams. Water fractures are most common (76.4%) hinting at the presence of activities related to stone boiling although features of this type were not discovered during excavation. The fire broken rock from feature 4 exhibits bedding fractures indicative of prolonged exposure to direct heat, further evidence that this feature was used as a small rock-lined hearth.

Faunal Assemblage

A total of 1473 faunal specimens were recovered weighing 3063.3 grams. At least three taxa have been identified including *Bison bison*, *Canis* sp., and *Thomomys talpoides*. Specimens that could not be identified beyond the level of large artiodactyl are also numerous and are thought to represent fragmented bison elements.

Bison bison, NISP=250, MNE=34, MNI=3: two petrous, P^2, three incisor/canine, cervical vertebrae, two proximal scapulae, two distal humeri, proximal ulna, two internal carpals, ulnar carpal, unciform carpal, metacarpal, two second phalanges, ischial portion of the acetabulum, proximal femur, three distal tibiae, tibia midshaft, two lateral malleoli, two calcanei, three astragali, three fused 2/3 tarsals, fused C/4 tarsal, distal inferior sesamoid, proximal lateral sesamoid. An MNI of three was obtained from the fused 2/3 tarsal. Immature specimens were not identified in the assemblage. Three of the carpals, two tarsals and a lateral malleolus were complete enough to obtain measurements in an attempt to determine gender (Appendix B; Table 9). Five of the specimens are identified as female and one (the fused central/4^{th} tarsal) as a cow/calf. The three carpals were semi-articulated and are likely from the same animal.

Canis sp., NISP=1, MNE=1, MNI=1: atlas. This specimen was fragmented and subsequently reconstructed for identification purposes. The specimen is similar in size to both *Canis latrans* and *Canis familiaris*. It is smaller than the wolf (*Canis lupus*) in the collections at the University of Saskatchewan.

Thomomys talpoides, NISP=1, MNE=1, MNI=1: proximal scapula. This specimen is similar in colour to the other faunal specimens in this assemblage. It is possible that the specimen represents an animal that was alive at the time of occupation but given the activity of pocket gophers both now and in the past this specimen is likely intrusive.

Large Artiodactyl (SC6), NISP=149: longbone fragments (72), tooth enamel (63), rib fragments (10), vertebral fragments (2), and metapodial fragments (2).

Moderate weathering (Stage 3) is more common in the level 3 assemblage and was noted on 10.5% of the specimens by NISP. A similar percentage of early stage weathering was also recorded (10.1%). Weathering was most commonly expressed as a series of long crack lines and exfoliated cortical bone.

The percentage NISP of rootlet etching on specimens is relatively high at 21.4% and is similar to percentages from occupations 2a and 2b. Like the previously described assemblages, many of the smaller specimens were encased in a mass of rootlets that have etched much of the cortical surface. Still, it was possible to identify a number of tooth marks on several of the larger elements. Tooth marks in the form of shallow paired grooves are present on the condylar surface of one astragalus. Tooth marks from a large rodent are present on one of the fused 2/3 tarsals, the acetabulum and an astragalus. These grooves are too wide and too deep to be associated with a microtine rodent and are similar to the incisor width of *Thomomys talpoides*. Carnivore chewing in the form of punctures and furrows is present on one calcaneus. Several punctures were also noted on a vertebral centrum.

Four small cut marks are present on a single unidentified specimen. Spiral fractures are present on nearly all of the larger bison elements and the percentage NISP of spiral fractures in level 3 is the highest of all occupation levels (14.1%). A humerus and tibia in particular have long spiral fractures with associated points of impact that appear to be related to attempts at removing marrow.

Burning was noted on 64 specimens and 75 specimens were heated enough to become calcined. When combined, a total of 9.4% of the specimens in level 3 show evidence of fire damage. Over half of the burned and calcined specimens (52.0%) are directly associated with hearth feature 4. Of the remaining specimens, 34 (24.5%) were found in units at the extreme eastern end of the main excavation block.

Summary and Discussion: Two features were identified in occupation 3. Feature 2 is a cluster of fire broken rock and lithic debitage. There is no evidence of a pit and it appears that the concentration has been deposited as a result of boiling pit maintenance. Feature 4 is a small hearth that is lined by rock along the eastern margin. Slight discoloration of the soil due to oxidization indicates minimal use or relatively low temperatures.

Tools are relatively numerous in level 3 and include a number of bifaces, cores, scrapers, MURLs, perforators, broken projectile points, spokeshaves and wedges. A large number of primary, secondary and platform rejuvenation flakes seems indicative of primary production and subsequent reduction of large flakes. Many of these have been retouched and/or utilized as expediency tools. Local materials dominate the lithic assemblage but exotics such as Montana chert, Tongue River silicified sediment and Knife River chalcedony have been identified and indicate a connection to populations farther to the south. A single flake of Cathead chert may also indicate potential trade with groups in Manitoba although considerable caution should be applied to this interpretation given the extremely small sample size. Fire broken rock is also relatively common and is concentrated in the eastern portion of the main block. With the exception of specimens from feature 4, most of the fire broken rocks exhibit water fractures typically associated with specimens from stone boiling features.

The faunal assemblage is more heavily weathered than the assemblages from occupations 2a and 2b. A small number of bison elements were identified and suggest the presence of at least three animals. Measurements from the carpals and tarsals indicate that at least one of these is a female and another is either a large female or immature male. Immature individuals were not identified and season of occupation is difficult to assess. A single canid vertebra was also discovered and is attributed to a medium-sized dog or a coyote. The presence of a canid is also indicated by tooth marks on several of the bison elements.

Artifact distribution maps reveal the presence of several main activity areas (Appendix B; Figure B.7 and B.8). In the eastern portion of the excavation block artifacts are clearly associated with features 2 and 4. Fire broken rock was identified within both features. Faunal remains tend to be concentrated directly between the features and most of the specimens are limb elements from a bison (especially the humerus, scapula and tibia). Lithic debitage is more prevalent to the immediate east of feature 2 although no discernable pattern is evident from the planview. Tools are also scattered around these features but are most common to the immediate west of feature 4 as well as in units to the south of both features. There are relatively few finishing and re-sharpening flakes in this assemblage. Given the high number of cores and MURLs it appears that the primary production of flakes for flake tools is an important activity in this assemblage. A small concentration of lithic debitage and several core fragments to the immediate south of feature 2 may indicate one area where such an activity took place.

A number of end scrapers, MURLs and several perforators were found in the southeastern units of the excavation block. Artifacts are relatively sparse in these units and it seems likely that the area was used to process and finish hides.

Another activity area is indicated by the presence of a concentration of faunal specimens and fire broken rock in the extreme northwestern end of the excavation. Bison elements from this area include a number of vertebrae, cranial (both skull and mandible) and hindlimb elements (mainly femur and tibia). Fire broken rock tends to be water fractured and may indicate the presence of a second stone boiling feature. A single core fragment represents the only tool identified in these units. The presence of cranial and vertebral elements may indicate secondary processing of bison elements and a relatively close proximity to the primary kill locality but specimens are too few and too fragmentary to make a definitive statement at this time.

A.3 Summary

The investigation and analysis of EgNo-23 provides an important glimpse into the cultural adaptations of local McKean populations in Saskatchewan. The destruction of a portion of this site, by heavy earth moving equipment, is unfortunate however without this disturbance both the kill site and habitation site would not have been recorded.

The initial investigation of the bone bed led to concerns over the cultural affiliation of the assemblage. Faunal elements were associated with both Besant and McKean Lanceolate projectile points however the stratigraphic position of several buried elements and the associated radiocarbon dates indicate that the bone scatter is more indicative of McKean. Evidence for a pound was not recorded during the collection of the faunal remains, although such evidence is likely to have been destroyed. Even so, the general topography of the area indicates the use of a natural trap to kill a predominately male herd of bison.

The occupations at EgNo-23 are significant in that they reveal a clear separation of the McKean Lanceolate and Duncan-Hanna projectile point types. The assemblage recovered from the lower McKean Lanceolate occupation may be associated with the kill site as evidenced by a number of artifacts, features and faunal remains that are more typical of a bison processing area. Even so, the artifacts and features recovered from level 3 do not support the intense processing of bison by a large number of individuals and it is possible that these assemblages represent un-related events. Radiocarbon dates from the disturbed bone bed and cultural level 3 support this assumption. Artifact assemblages from cultural level 2 appear to be more indicative of small-scale campsites occupied by a relatively small number of individuals. Activity areas within these campsites are relatively small and are concentrated around a number of shallow hearth features. Primary activities include food preparation and the refurbishment and/or production of stone tools.

Appendix B

EgNo-23 Site Data

Table B.1. Calculation of MNE, MAU and %MAU from Anatomical Landmarks.

Element	MNE	MAU	%MAU	Element	MNE	MAU	%MAU
Cranium				**Atlas**			
Frontal	2	1.00	5.6	Prezygopophyses	6	3.00	16.7
Horn Core	1	0.50	2.8	Postzygopophyses	5	2.50	13.9
Parietal	2	1.00	5.6	Neural arch	4	4.00	22.2
Occipital	2	2.00	11.1	Dorsal tubercle	3	3.00	16.7
Occipital condyle	2	1.00	5.6	Ventral arch	6	6.00	33.3
Petrous temporal	7	3.50	19.4				
Zygomatic temporal	2	1.00	5.6	**Axis**			
Tympanic temporal	1	0.50	2.8	Prezygopophyses	4	2.00	11.1
External auditory meatus	0	0.00	0.0	Postzygopophyses	3	1.50	8.3
Zygomatic	0	0.00	0.0	Neural arch	3	3.00	16.7
Nasal	1	0.50	2.8	Neural spine	3	3.00	16.7
Sphenoid	0	0.00	0.0	Transverse process	6	3.00	16.7
Ethmoid	0	0.00	0.0	Centrum	4	4.00	22.2
Premaxilla	1	0.50	2.8	Odontoid process	6	6.00	33.3
Maxilla	0	0.00	0.0				
1st premolar	5	2.50	13.9	**Cervical**			
2nd premolar	1	0.50	2.8	Prezygopophyses	12	1.20	6.7
3rd premolar	0	0.00	0.0	Postzygopophyses	7	0.70	3.9
1st/2nd molar indet	16	4.00	22.2	Neural arch	19	3.80	21.1
3rd molar	2	1.00	5.6	Neural spine	2	0.40	2.2
				Transverse process	12	1.20	6.7
Mandible				Centrum	20	4.00	22.2
Articular condyle	19	9.50	52.8				
Coronoid process	13	6.50	36.1	**Thoracic**			
Mandibular foramen	4	2.00	11.1	Prezygopophyses	32	1.14	6.3
Lower border	6	3.00	16.7	Postzygopophyses	52	1.86	10.3
Diastema	17	8.50	47.2	Neural arch	34	2.43	13.5
Mandibular symphysis	7	3.50	19.4	Neural spine	50	3.57	19.8
Mental foramen	0	0.00	0.0	Transverse process	40	1.43	7.9
Incisor/canine	5	0.63	3.5	Centrum	73	5.21	28.9
1st premolar	12	6.00	33.3				
2nd premolar	24	12.00	66.7	**Lumbar**			
3rd premolar	21	11.50	63.9	Prezygopophyses	18	1.50	8.3
1st molar	21	10.50	58.3	Postzygopophyses	14	1.17	6.5
2nd molar	22	11.00	61.1	Neural arch	16	2.67	14.8
1st/2nd molar indet	28	17.75*	98.6	Neural spine	5	0.83	4.6
3rd molar	36	18.00	100.0	Transverse process	5	0.42	2.3
				Centrum	19	3.17	17.6
Hyoid	3	1.50	8.3				
				Sacrum	4	4.00	22.2
				Caudal	6	0.43	2.4

* This calculation includes all 1st and 2nd molars combined.

Table B.1. Calculation of MNE, MAU and %MAU from Anatomical Landmarks (Continued).

Element	MNE	MAU	%MAU	Element	MNE	MAU	%MAU
Scapula				**Radial carpal**	12	6.00	33.3
Glenoid	9	4.50	25.0				
Coracoid	3	1.50	8.3	**Internal carpal**	11	5.50	30.6
Neck	9	4.50	25.0				
Acromion	0	0.00	0.0	**Ulnar carpal**	10	5.00	27.8
Acromial spine	5	2.50	13.9				
Supraspinous fossa	8	4.00	22.2	**Unciform carpal**	6	3.00	16.7
Infraspinous fossa	8	4.00	22.2				
				Fused 2/3 carpal	13	6.50	36.1
Humerus							
Head	1	0.50	2.8	**Accessory carpal**	2	1.00	5.6
Lateral tuberosity	0	0.00	0.0				
Medial tuberosity	0	0.00	0.0	**Metacarpal**			
Proximal shaft	2	1.00	5.6	Carpal 2/3 facet	16	8.00	44.4
Deltoid tuberosity	3	1.50	8.3	Unciform facet	16	8.00	44.4
Teres major tuberosity	0	0.00	0.0	Proximal anterior foramen	13	6.50	36.1
Teres minor tuberosity	0	0.00	0.0	Proximal posterior foramen	13	6.50	36.1
Post. Lat. foramen	1	0.50	2.8	Proximal anterior shaft	16	8.00	44.4
Olecranon fossa	5	2.50	13.9	Proximal posterior shaft	13	6.50	36.1
Radial fossa	3	1.50	8.3	Distal anterior foramen	19	9.50	52.8
Medial epicondyle	6	3.00	16.7	Distal posterior foramen	17	8.50	47.2
Lateral epicondyle	4	2.00	11.1	Distal anterior shaft	19	9.50	52.8
Trochlea	12	6.00	33.3	Distal posterior shaft	17	8.50	47.2
Capitulum	10	5.00	27.8	Medial condyle	13	6.50	36.1
Distal shaft	3	1.50	8.3	Lateral condyle	13	6.50	36.1
Radius				**5th metacarpal**	0	0.00	0.0
Lateral glenoid cavity	6	3.00	16.7				
Medial glenoid cavity	15	7.50	41.7	**Prox. Lat. sesamoid**	4	0.50	2.8
Radial tuberosity	2	1.00	5.6				
Posterior lateral foramen	6	3.00	16.7	**Prox. Med. sesamoid**	10	1.25	6.9
Proximal posterior shaft	12	6.00	33.3				
Proximal anterior shaft	12	6.00	33.3	**Dist. Inf. sesamoid**	4	0.25	1.4
Distal posterior shaft	6	3.00	16.7				
Distal anterior shaft	6	3.00	16.7	**1st phalanx**			
Radial carpal facet	12	6.00	33.3	Proximal phalanx	54	13.50	75.0
Internal carpal facet	10	5.00	27.8	Distal phalanx	58	14.50	80.6
Ulna				**2nd phalanx**			
Olecranon	8	4.00	22.2	Proximal phalanx	51	12.75	70.8
Anconeal process	8	4.00	22.2	Distal phalanx	50	12.50	69.4
Semilunar notch	7	3.50	19.4				
Coronoid process	6	3.00	16.7	**3rd phalanx**			
Shaft	7	3.50	19.4	Proximal phalanx	28	7.00	38.9
Styloid process	2	1.00	5.6	Distal phalanx	18	4.50	25.0

Table B.1. Calculation of MNE, MAU and %MAU from Anatomical Landmarks (Continued).

Element	MNE	MAU	%MAU	Element	MNE	MAU	%MAU
Innominate				**Fused C/4 tarsal**	11	5.50	30.6
Ilium blade	1	0.50	2.8				
Ilium body	2	1.00	5.6	**Fused 2/3 tarsal**	5	2.50	13.9
Sacral tuber	1	0.50	2.8				
Ilium acetabulum	5	2.50	13.9	**Talus**			
Ischium blade	0	0.00	0.0	Proximal condyles	17	8.50	47.2
Ischium body	3	1.50	8.3	Distal condyles	19	9.50	52.8
Coxal tuber	1	0.50	2.8				
Ishium acetabulum	7	3.50	19.4	**Calcaneus**			
Pubis body	5	2.50	13.9	Sustentaculum	12	6.00	33.3
Pubic symphysis	0	0.00	0.0	Tuber calis	12	6.00	33.3
Pubis acetabulum	7	3.50	19.4	Proximal epiphysis	5	2.50	13.9
Femur				**Metatarsal**			
Head	4	2.00	11.1	Tarsal C/4 facet	6	3.00	16.7
Neck	3	1.50	8.3	Tarsal 2/3 facet	7	3.50	19.4
Greater trochanter	0	0.00	0.0	Proximal anterior foramen	0	0.00	0.0
Lesser trochanter	3	1.50	8.3	Proximal posterior foramen	2	1.00	5.6
Proximal shaft	3	1.50	8.3	Proximal anterior shaft	3	1.50	8.3
Post. Med. foramen	1	0.50	2.8	Proximal posterior shaft	3	1.50	8.3
Supercondyloid fossa	3	1.50	8.3	Distal anterior foramen	7	3.50	19.4
Trochlea	4	2.00	11.1	Distal posterior foramen	7	3.50	19.4
Medial condyle	8	4.00	22.2	Distal anterior shaft	8	4.00	22.2
Lateral condyle	1	0.50	2.8	Distal posterior shaft	8	4.00	22.2
Medial epicondyle	2	1.00	5.6	Medial condyle	7	3.50	19.4
Lateral epicondyle	1	0.50	2.8	Lateral condyle	6	3.00	16.7
Distal shaft	4	2.00	11.1				
				2nd metatarsal	0	0.00	0.0
Patella	8	4.00	22.2				
				5th metatarsal	0	0.00	0.0
Tibia							
Medial condyle	4	2.00	11.1				
Lateral condyle	4	2.00	11.1				
Tibial tuberosity	1	0.50	2.8				
Anterior crest	2	1.00	5.6				
Posterior lateral foramen	5	2.50	13.9				
Proximal anterior shaft	7	3.50	19.4				
Proximal posterior shaft	13	6.50	36.1				
Distal anterior shaft	6	3.00	16.7				
Distal posterior shaft	3	1.50	8.3				
Medial groove	13	6.50	36.1				
Lateral groove	12	6.00	33.3				
Medial malleolus	8	4.00	22.2				
Lateral malleolus	5	2.50	13.9				

Table B.2. Summary of Metaconid Height Measurements from Bison Mandibular Molars. *

Cat #	Height (M1)	Cat #	Height (M2)	Cat #	Height (M3)
15796	31.43	15842	34.10	15797	51.65
15799	(E) 16.47	15843	21.41	15802	47.53
15801	22.54	15844	40.11	15803	57.61
15844	23.90	16170	(E) 57.95	16140	65.51
15845	18.64	16171	63.22	16141	63.05
16172	32.22	16176	68.48	16142	58.88
16173	32.77	16179	(E) 39.51	16143	43.73
16191	24.08	16186	39.03	16144	60.69
16196	38.62	16190	58.85	16145	40.59
16199	(E) 30.24	16192	(E) 62.9	16147	63.79
16200	41.38	16194	38.93	16148	48.36
16205	19.16	16197	49.40	16151	53.47
16208	(E) 36.89	16206	55.73	16152	56.39
16209	(E) 46.69	16207	50.75	16153	57.28
16212	41.93	16211	57.80	16154	67.06
16213	(E) 28.96	16217	(E) 44.82	16155	51.86
16225	36.54	16218	58.93	16156	51.27
16226	(E) 40.86	16220	(E) 54.91	16157	54.37
16230	20.46	16221	41.18	16161	32.22
		16223	55.94	16162	39.99
		16228	60.37	16164	54.57
				16166	(E) 67.90
				16167	(E) 48.65

* Measurements designated (E) are estimated due to slight enamel breakage.

Table B.3. Average Metaconid Height of Bison Mandibular Molars by Age Group.

Age Group	Average Height (M1)	Average Height (M2)	Average Height (M3)
1	-	-	-
2	-	68.48	-
3	46.69	63.06	-
4	41.39	58.78	66.82
5	37.35	55.53	62.51
6	31.12	50.08	57.54
7	-	44.82	52.87
8	23.51	39.75	48.18
9	19.42	34.10	41.44
10	16.47	21.41	32.22

Table B.4. Mearurements of Length (L), Greatest Length (GL) and Distal Height (DH) with the Calculated Discriminant Function (*f*) of Bison First Front Phalanges From EgNo-23.

Catalogue #	L	GL	DH	*f**	Side	Sex
15002	64.74	67.42	31.20	33.08	Right	♂
15006	70.14	74.65	29.34	34.24	Right	♂
15007	72.12	73.07	31.18	33.84	Right	♂
15009	68.64	72.62	32.13	35.15	Right	♂
15010	67.58	70.72	30.56	33.62	Right	♂
15011	68.60	70.44	33.50	34.78	Right	♂
15012	70.24	74.15	29.13	33.84	Right	♂
15015	69.13	73.33	33.27	36.00	Right	♂
15018	59.76	61.36	23.08	26.96	Right	♀
15020	68.08	74.26	32.40	36.32	Right	♂
15021	71.03	74.10	28.24	33.09	Right	♂
15023	68.98	72.92	33.90	36.18	Right	♂
15028	64.31	67.91	30.65	33.17	Left	♂
15029	68.30	72.38	30.33	34.14	Left	♂
15032	70.03	73.69	29.89	34.07	Left	♂
15034	65.26	65.13	29.51	30.82	Left	Small ♂?
15035	71.09	74.23	31.44	34.89	Left	♂
15036	70.90	74.72	29.01	33.87	Left	♂
15039	71.47	75.14	29.85	34.38	Left	♂
15040	72.25	76.29	29.02	34.30	Left	♂
16389	65.61	65.42	27.79	29.92	Left	Small ♂?

* Discriminant Function = [GL x 0.52067 + DH x 0.54678 – L x 0.29469]

Table B.5. Bison Carpal Measurements (After Morlan 1991).

Element	Catalogue #	Measurements*			Side	Gender**
		Length	**Width**	**Depth**		
Radial	15186	3.41	3.32	5.32	Left	♂
	15187	3.66	3.26	5.12	Left	♂
	15188	3.47	2.88	5.09	Left	Small ♂?
	15189	3.42	3.47	5.59	Right	♂
	15190	3.52	3.32	5.43	Right	♂
	15191	3.44	3.31	5.27	Right	♂
	15192	3.52	3.31	5.53	Right	♂
	15193	3.32	3.05	4.87	Right	Small ♂?
	15194	3.00	2.79	4.63	Right	♀/©
	15195	3.38	E2.96	NM	Right	Small ♂?
	15196	3.58	E3.27	NM	Right	♂
	16408	3.20	3.04	4.92	Right	Small ♂?
		Length	**Width**	**Depth**		
Internal	15177	3.35	3.86	4.98	Left	♂
	15178	3.05	3.35	4.88	Left	Small ♂?
	15180	2.80	3.29	5.02	Right	Small ♂?
	15181	2.75	3.00	4.45	Right	♀/©
	15182	3.54	3.72	5.20	Right	♂
	15183	3.23	3.52	5.29	Right	♂
		Ant. Length	**Width**	**Depth**		
Ulnar	15149	3.44	3.15	4.56	Left	♂
	15150	3.29	3.28	3.97	Left	Small ♂?
	15151	2.92	2.68	3.57	Right	♀/©
	15152	3.42	3.20	4.52	Right	♂
	15153	3.60	3.42	4.39	Right	♂
	15154	2.98	2.37	3.75	Right	♀/©
	15155	3.17	3.20	4.50	Right	♂
	15156	2.96	2.74	3.77	Right	♀/©
	16409	3.64	3.09	4.37	Left	♂
	16410	E3.14	2.68	3.77	Left	Small ♂?
		Length	**Width**	**Depth**		
Fused 2/3	15159	2.77	4.81	4.12	Right	♂
	15160	2.37	4.47	3.96	Right	Small ♂?
	15161	2.08	3.75	3.52	Right	♀/©
	15162	2.26	3.86	3.34	Right	♀/©
	15164	2.35	3.97	3.55	Left	♀/©
	15165	2.53	4.49	E4.23	Left	♂
	15166	2.68	4.56	4.28	Left	♂
	15167	2.62	4.76	4.11	Left	♂
	15168	2.78	4.74	4.24	Left	♂
	15170	2.24	E4.48	3.83	Left	Small ♂?
	16407	2.59	4.80	4.30	Right	♂
		Length	**Width**	**Depth**		
Unciform	15171	2.85	3.40	3.65	Left	Small ♂?
	15172	2.69	2.89	3.41	Left	♀/©
	15173	2.47	2.87	3.30	Left	♀/©
	15174	2.96	2.98	3.52	Right	♀/©
	15175	2.52	2.91	3.27	Right	♀/©
	15176	E2.83	3.27	3.67	Right	Small ♂?

* E = Estimated; NM = Not Measured

** ♀/© refers to female or calf

Table B.6. Bison Tarsal Measurements (After Morlan 1991).

Element	Catalogue #	Measurements*			Side	Gender**
		Length	Width	Depth		
Tarsal 2/3	15206	1.19	2.72	4.11	Right	Small ♂?
	15207	1.26	2.73	4.28	Left	Small ♂?
	15208	1.42	2.91	4.55	Left	♂
	16406	1.40	3.11	4.44	Right	♂
		Length	Width	Depth		
Tarsal C/4	15197	E5.07	6.74	6.29	Left	♂
	15198	5.19	6.77	6.52	Left	♂
	15199	5.33	6.98	6.91	Left	♂
	15200	5.30	7.02	6.78	Left	♂
	15201	5.15	6.70	6.33	Left	♂
	15202	4.46	5.76	5.44	Right	♀/©
		Length	Width	Depth		
Lat Malleolus	15209	2.67	1.85	4.02	Right	♂
	15210	2.82	2.03	3.81	Right	♂
	15211	2.59	2.03	4.18	Left	♂
	15212	2.66	1.98	4.13	Left	♂

* E = Estimated; NM = Not Measured
** ♀/© refers to female or calf

Table B.7. Bison Astragalus Measurements (After Morlan 1991).

Element	Catalogue #	Measurements*				Side	Gender**
		Lat.Length	Med Length	Prox Width	Dist Width		
Astragalus	15214	8.40	7.83	5.55	5.55	Left	♂
	15215	7.92	7.42	5.48	5.48	Left	♂
	15216	8.23	7.69	E4.97	4.97	Left	Small ♂?
	15217	7.71	7.20	5.10	5.10	Left	Small ♂?
	15218	7.73	7.34	5.54	5.54	Left	♂
	15219	7.96	7.51	5.39	5.39	Left	♂
	15224	7.56	7.26	E4.87	4.87	Right	Small ♂?
	15225	8.16	7.37	5.69	5.69	Right	♂
	15226	7.29	6.70	4.74	4.74	Right	♀/©
	15227	8.31	7.84	5.77	5.77	Right	♂
	16402	7.67	7.05	5.54	5.54	Left	Small ♂?
	16403	8.35	7.78	5.67	5.67	Right	♂

* E = Estimated; NM = Not Measured
** ♀/© refers to female or calf

Table B.8. Bison Calcaneus Measurements (After Morlan 1991).

Element	Catalogue #	Measurements*						Side	Gender**	Gender
		Length Talus Fac.	Length C/4 Fac.	Prox Width	Dist Width	Prox Depth	Dist Depth		Calcaneus A	Calcaneus B
Calcaneus	15232	3.52	4.67	4.21	5.56	4.82	6.48	Left	♂	♂
	15233	3.66	4.24	4.28	4.77	4.72	6.19	Left	Small ♂?	♂
	15234	3.64	4.18	4.21	5.03	4.54	6.05	Left	Small ♂?	♂
	15241	3.77	4.61	NM	NM	NM	NM	Right	NA	♂
	16396	3.33	4.22	4.35	5.85	4.59	6.24	Left	♂	Small ♂?
	16399	3.85	4.51	NM	5.49	NM	6.31	Right	♂	♂
	16400	3.74	4.23	3.94	5.57	4.77	6.15	Right	♂	♂
	16401	3.71	4.41	4.55	NM	E4.48	NM	Right	NA	♂

* E = Estimated; NM = Not Measured
** NA = Not Applicable

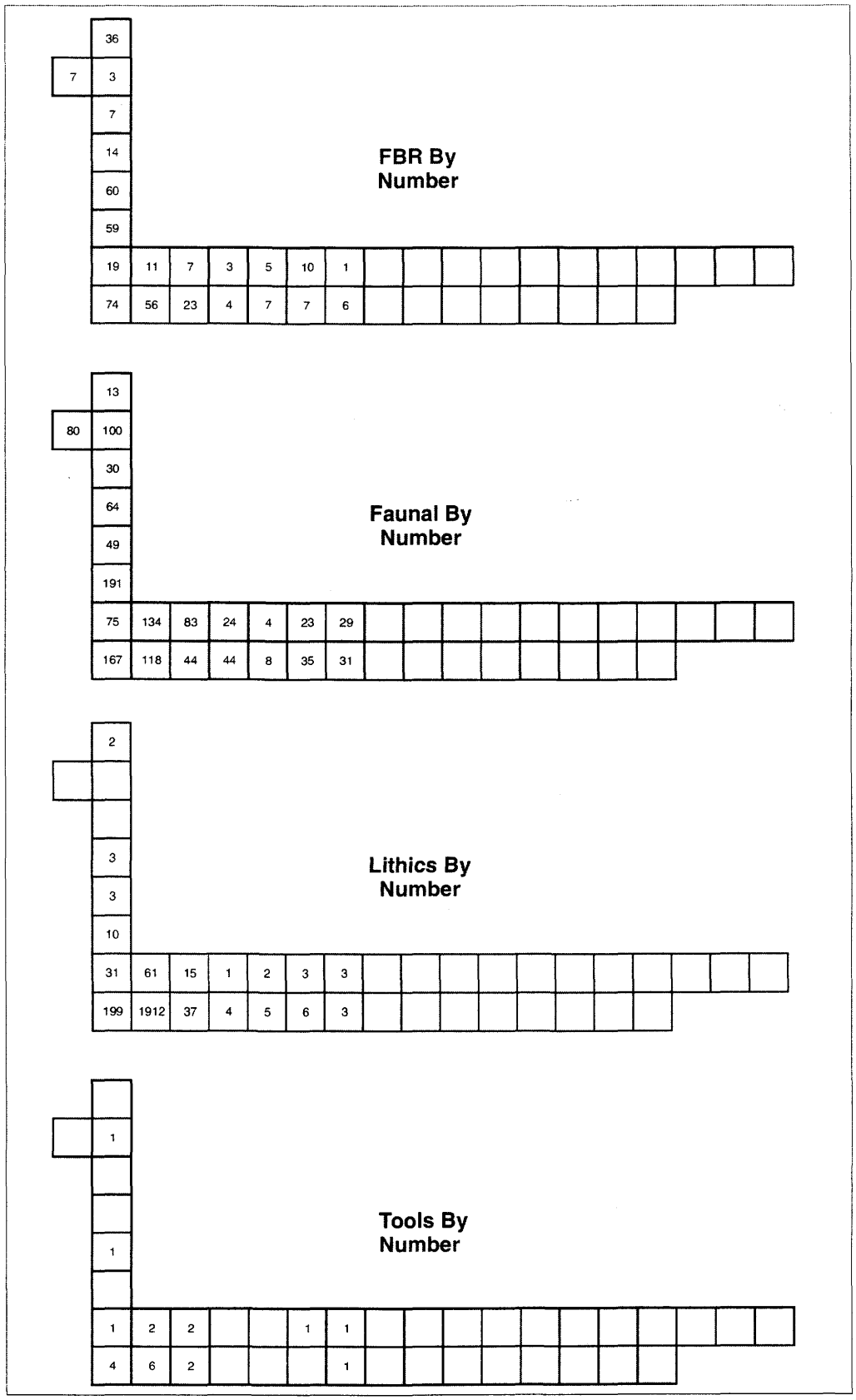

Figure B.1. Level 2 Artifact Distribution by Number.

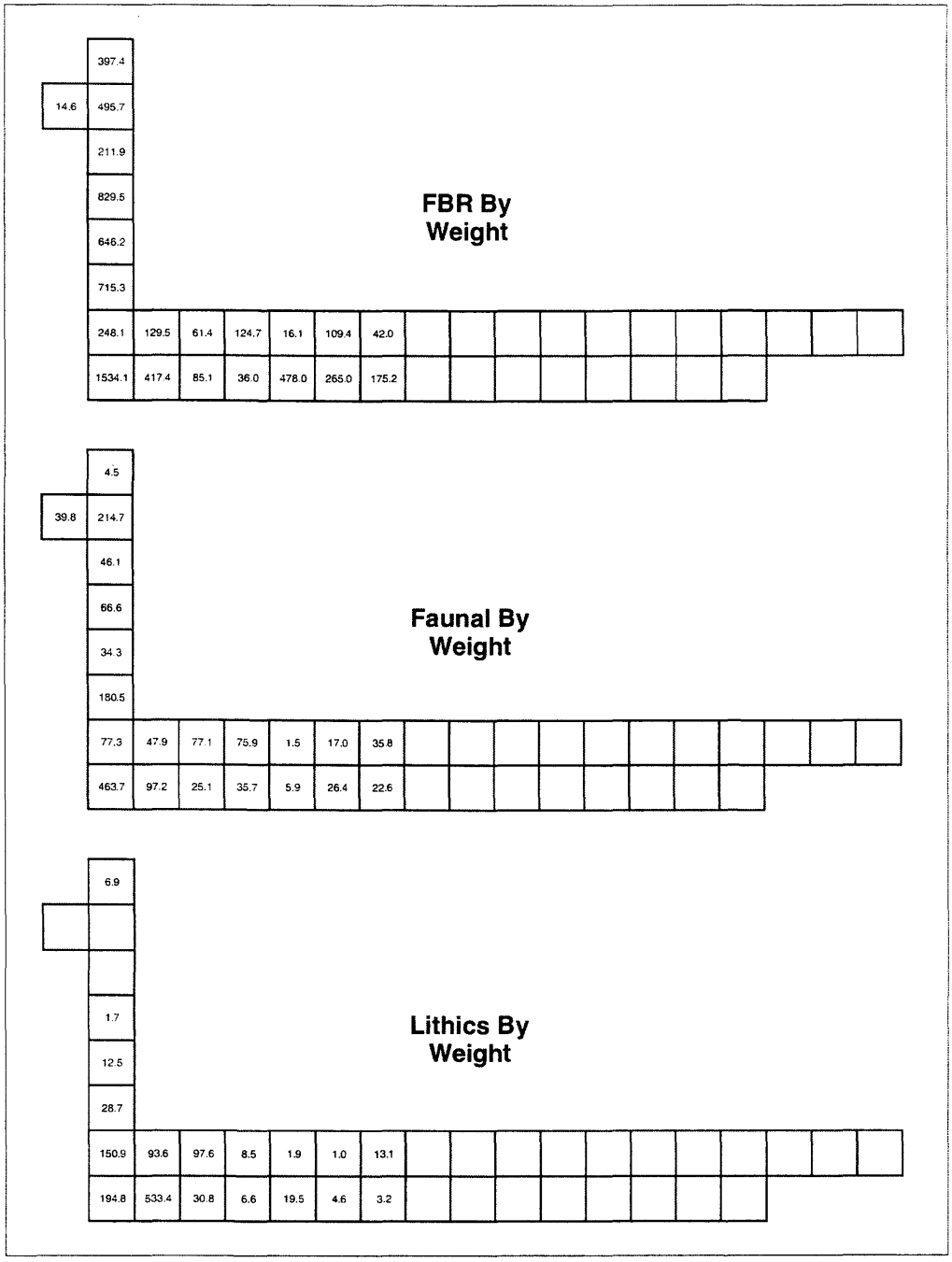

Figure B.2. Level 2 Artifact Distribution by Weight (grams).

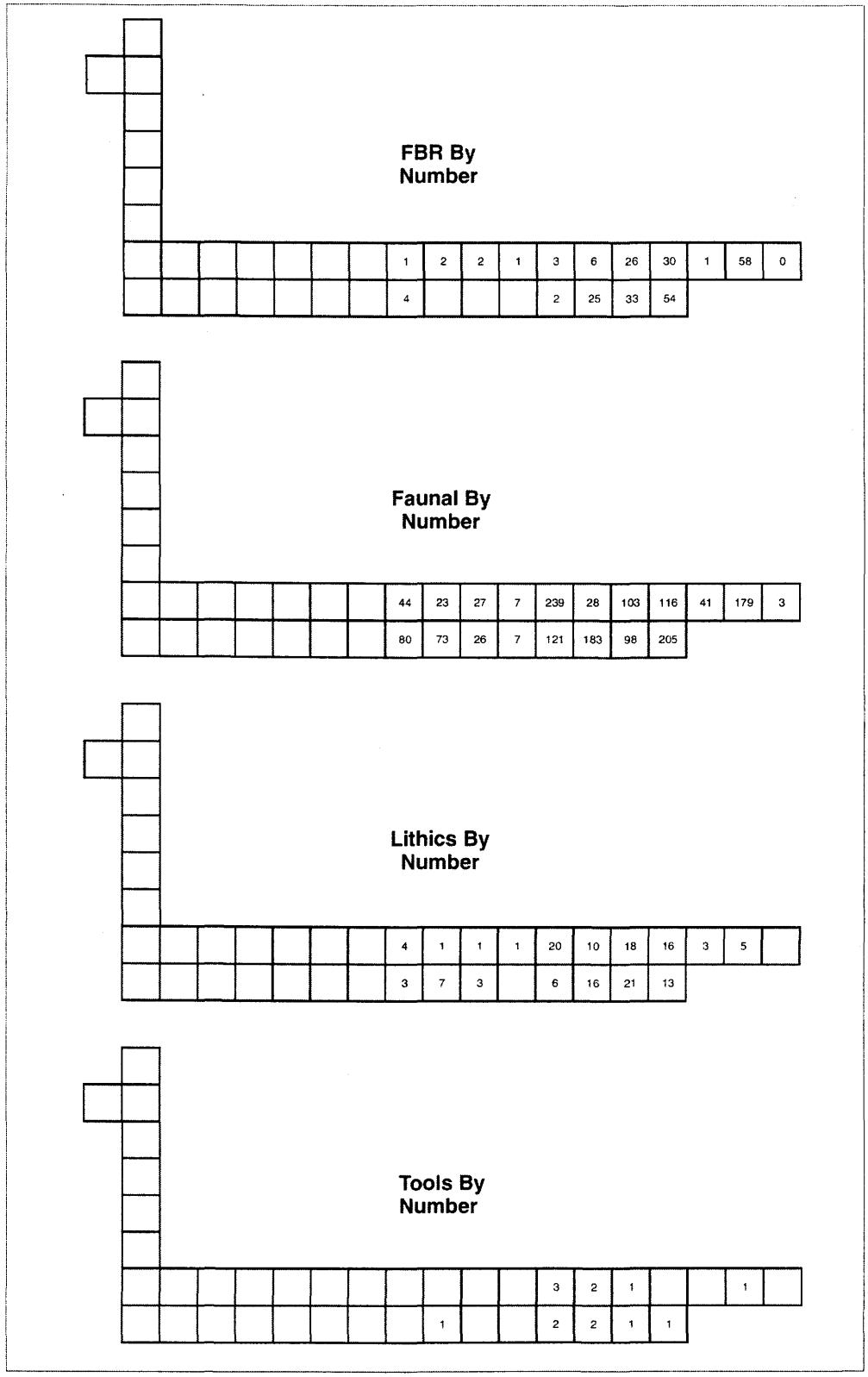

Figure B.3. Occupation 2a Artifact Distribution by Number.

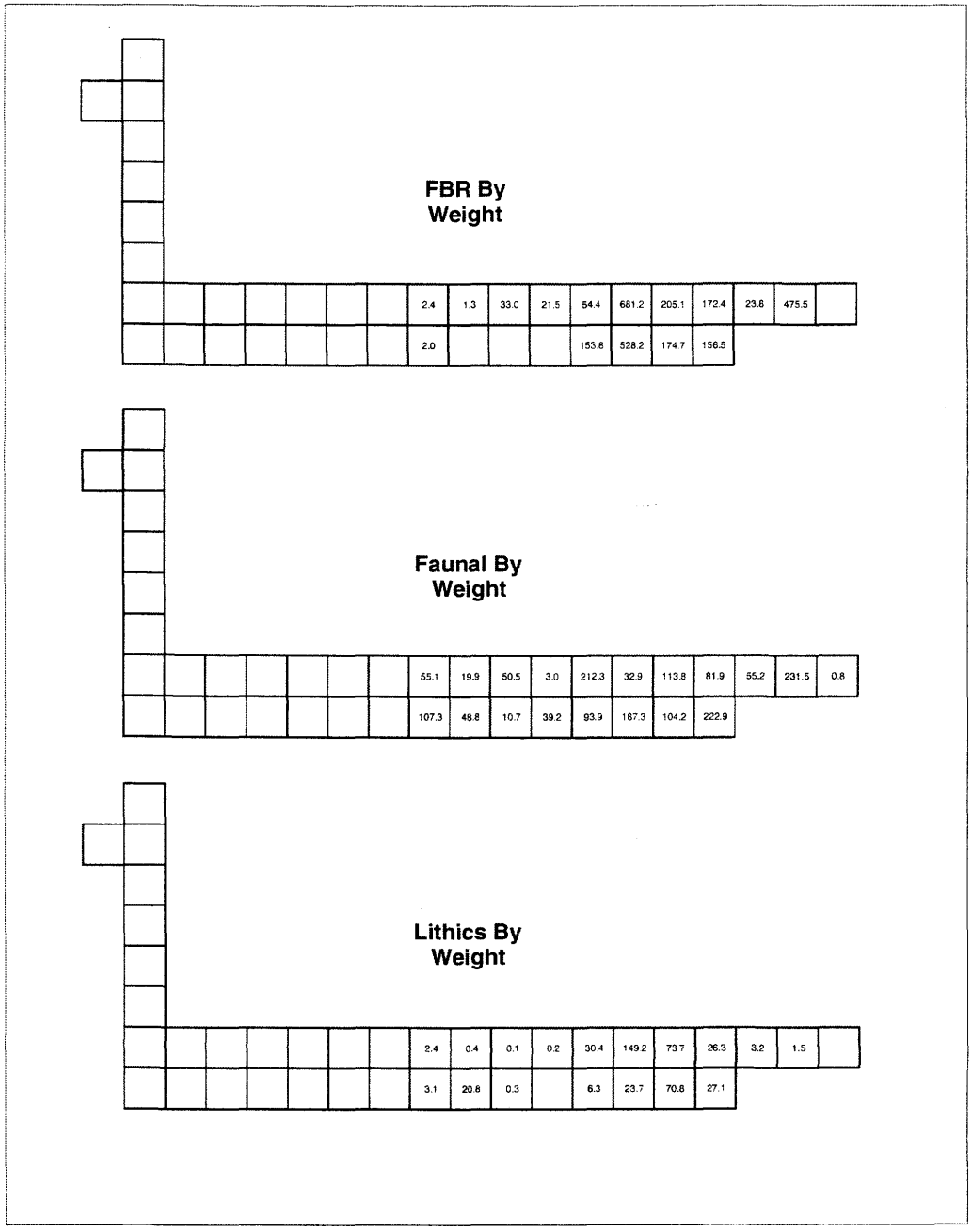

Figure B.4. Occupation Level 2a Artifact Distribution by Weight (grams).

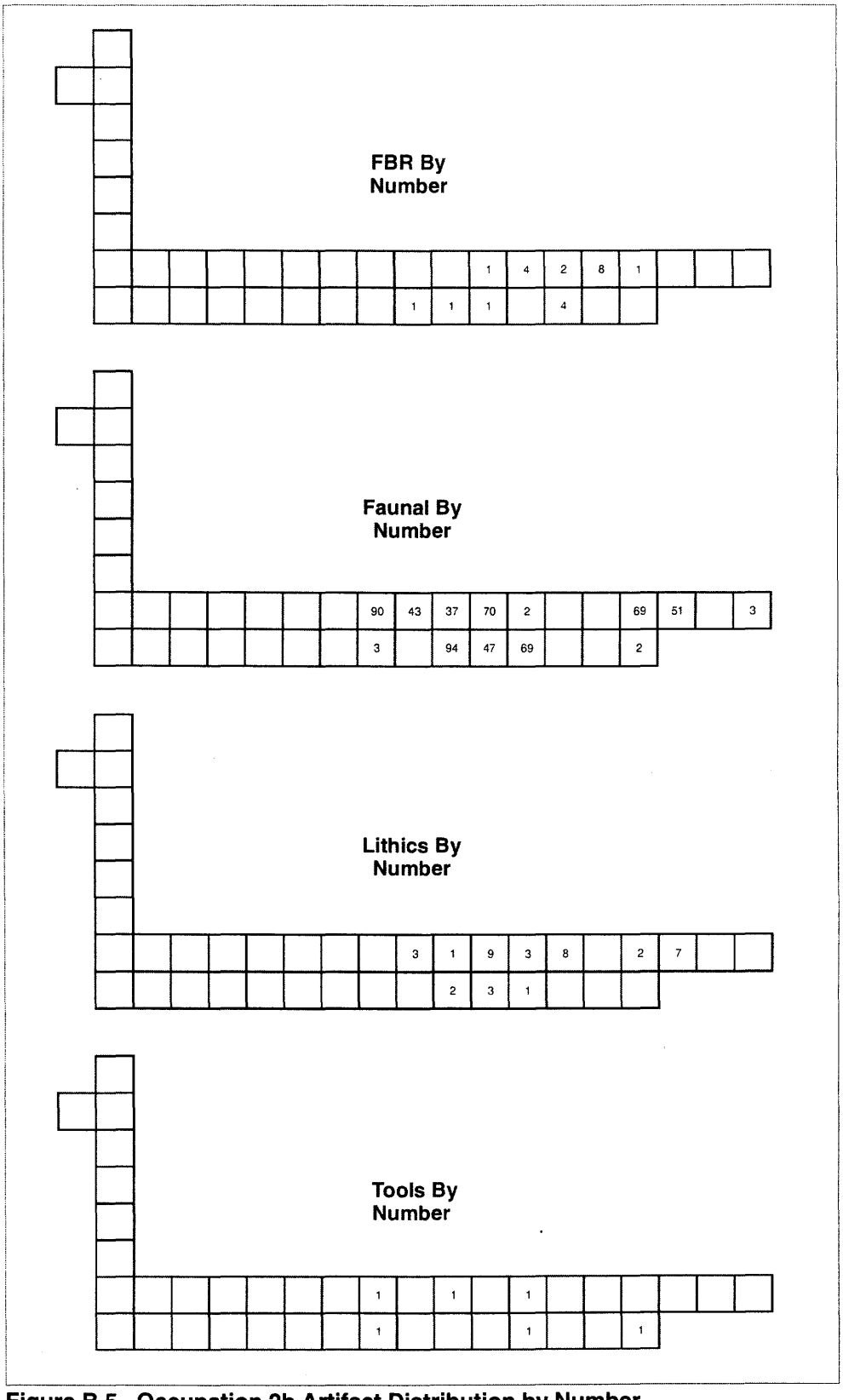

Figure B.5. Occupation 2b Artifact Distribution by Number.

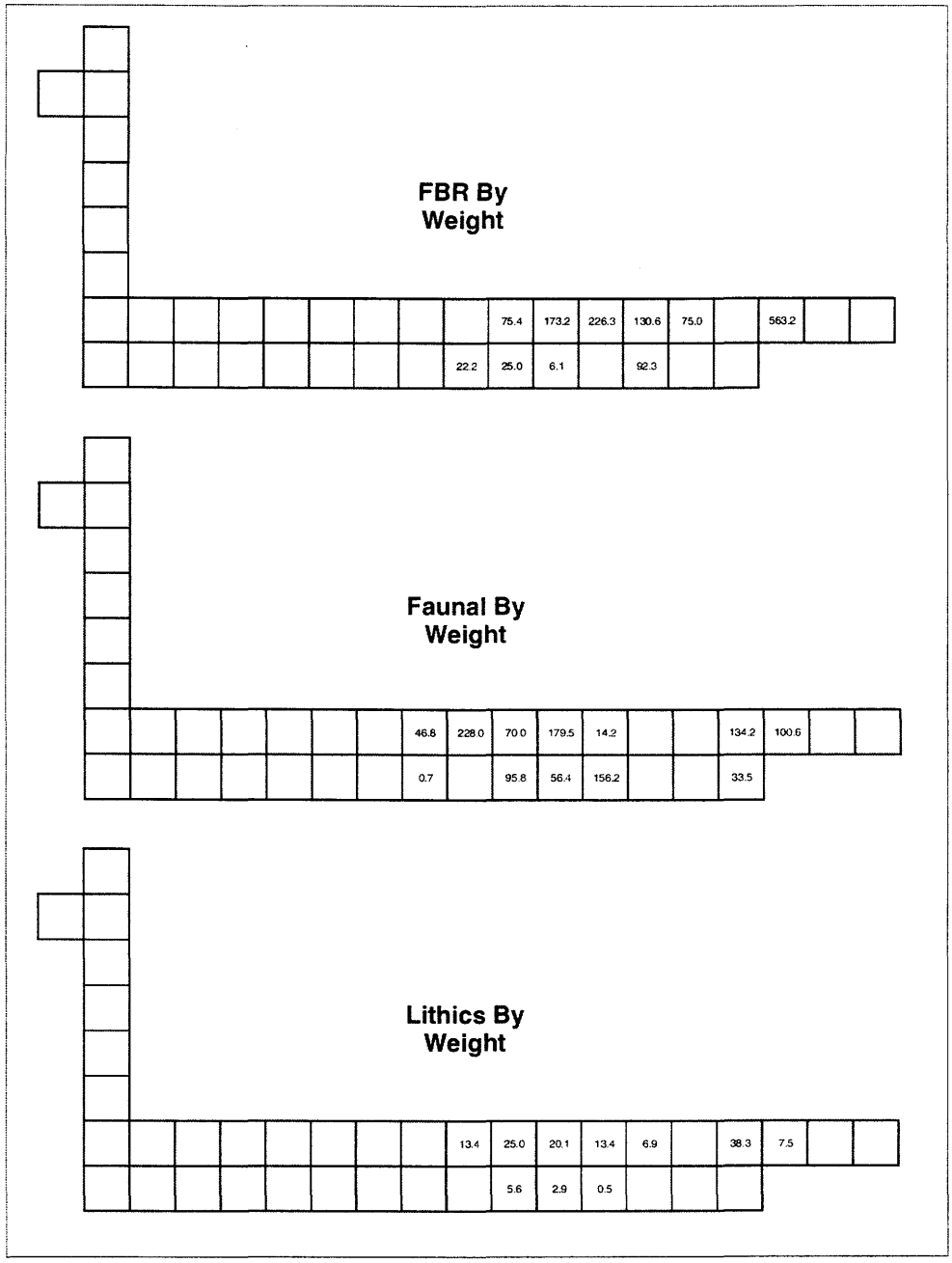

Figure B.6. Occupation Level 2b Artifact Distribution by Weight (grams).

Table B.9. Bison Carpal and Tarsal Measurements from Level 3 (After Morlan 1991).

Element	Catalogue #	Measurements*				Side	Gender**
		Length	**Width**	**Depth**			
Internal	16685	2.38	2.86	4.09		Right	♀
		Ant.Length	**Width**	**Depth**			
Ulnar	16686	3.01	2.48	3.93		Right	♀
		Length	**Width**	**Depth**			
Unciform	16684	2.51	3.21	3.51		Right	♀
		Length	**Width**	**Depth**			
Lat. Malleolus	16660	2.56	NM	3.83		Left	♀
		Lat.Length	**Med Length**	**Prox Width**	**Dist Width**		
Astragalus	17917	7.25	6.85	4.93	4.63	Left	♀
		Length	**Width**	**Depth**			
Tarsal C/4	16650	4.63	E6.11	6.16		Right	♀/©

* E = Estimated

** ♀/© refers to female or calf

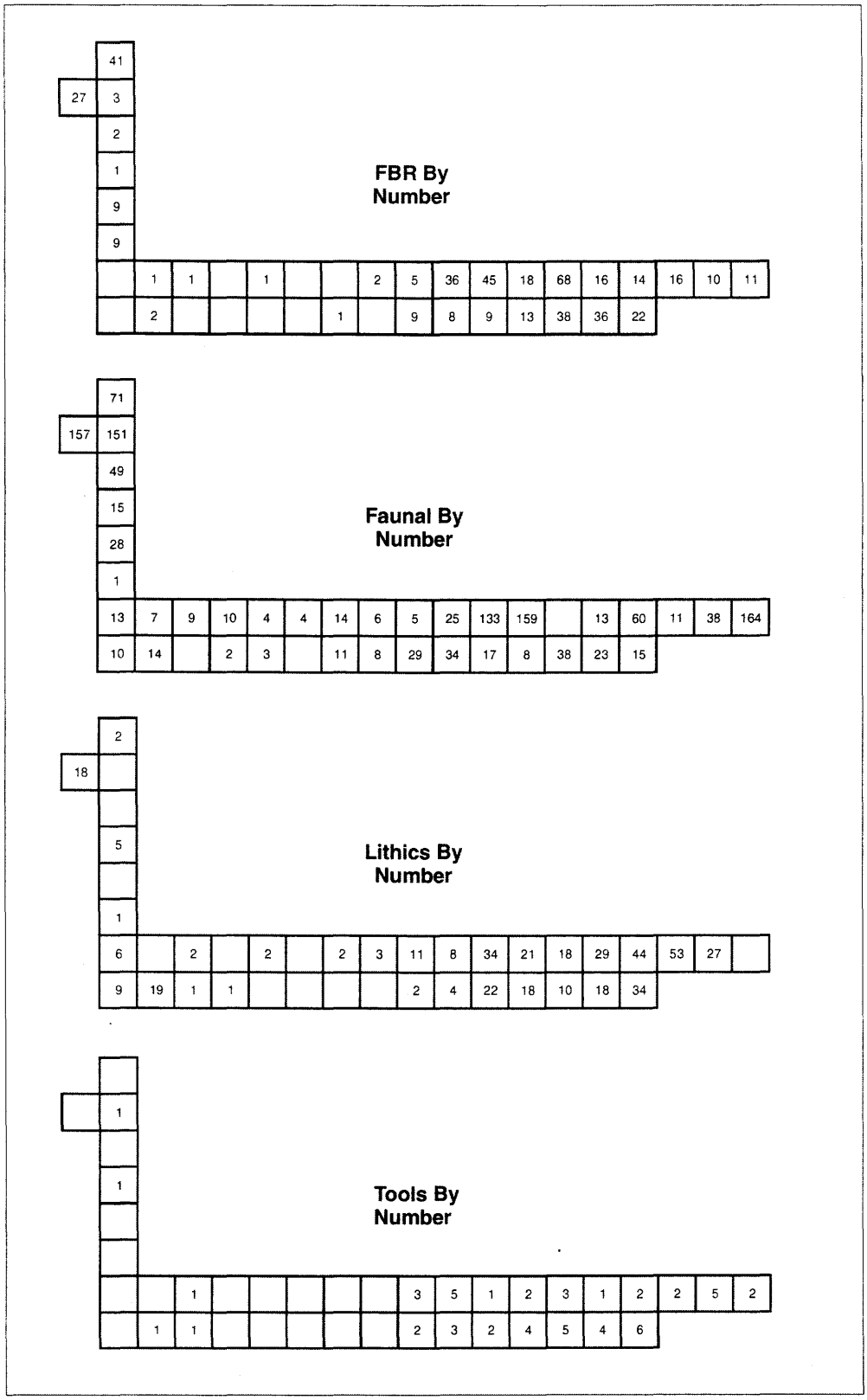

Figure B.7. Level 3 Artifact Distribution by Number.

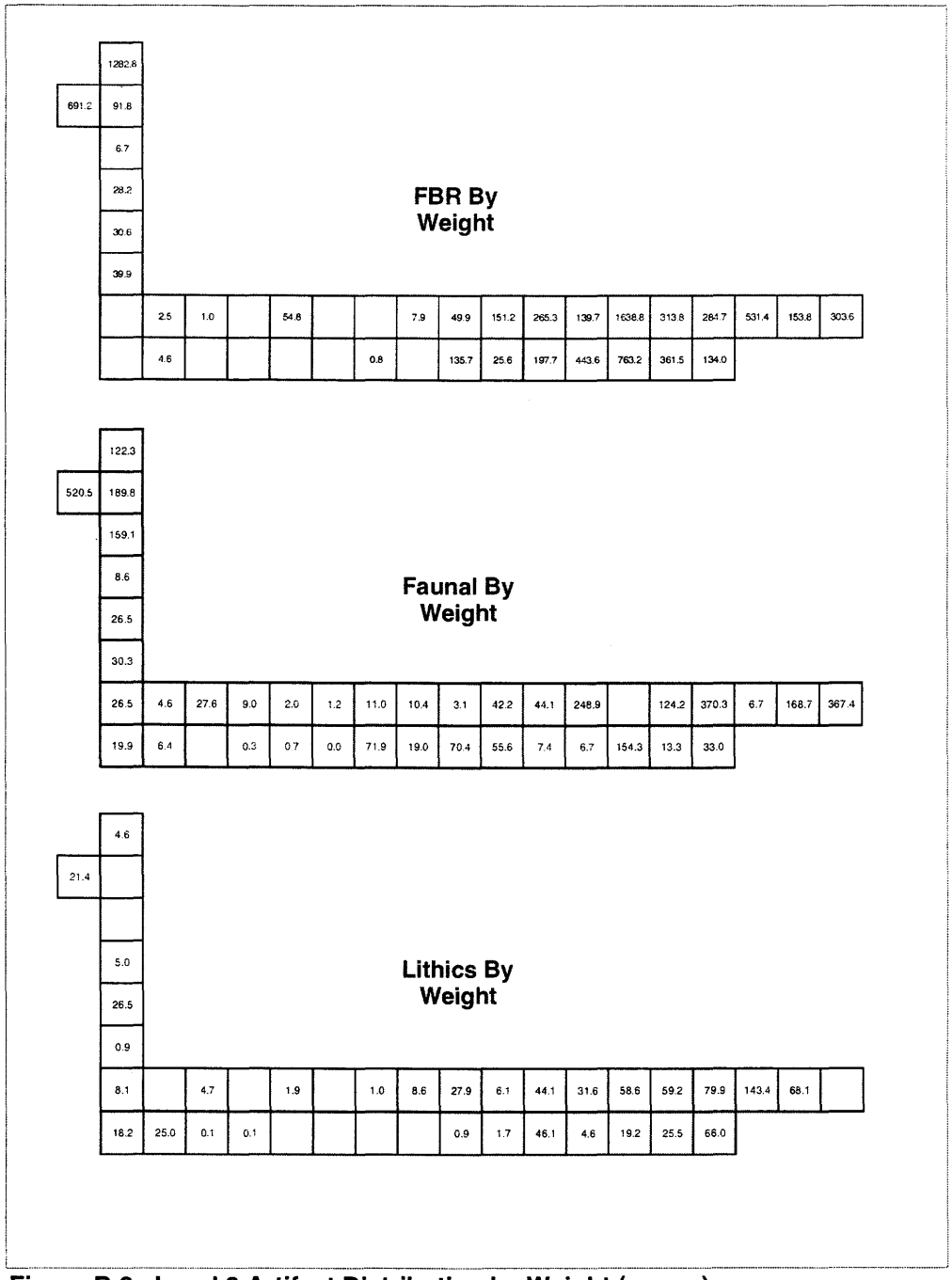

Figure B.8. Level 3 Artifact Distribution by Weight (grams).

Appendix C

Comparative Data

Table C.1. Lithic Tools and Features from Select McKean Series Components in Saskatchewan.

	RT11	RT12	RT13:1	RT13:2	RT13:3	RT13:4	TH5	CR:U	CR:L	Eg2a	Eg2b	Eg3	Sjov XXI
Formed Lithic Items:													
Hanna	1	8*	-	-	-	-	2	11?	-	1?	1?	-	1
Duncan	-	-	-	1?	-	-	4?	2?	-	1	-	-	-
McKean Lanceolate	-	-	-	1	-	2	1	-	7	-	-	1	-
Other Point Varieties**	-	-	-	-	-	-	-	2	-	-	-	1	-
Hafted Biface	-	1	1	-	-	-	-	1?	2	-	-	-	-
Pointed Biface	-	1	-	1	1	-	-	-	5	1	-	3	-
Ovate Biface	1	-	-	-	-	-	4	4	2	2	-	3	2
Irregular Biface	-	1	-	-	-	-	-	11?	5	-	-	1	-
Endscraper - Triangular	-	-	-	-	-	-	4	6	4	-	-	3	-
Endscraper - Parallel	-	-	-	-	-	-	-	3	1	-	-	2	-
Endscraper - Ovate	-	-	-	-	-	-	-	5	1	-	-	-	-
Endscraper - Irregular	-	-	-	1	-	-	-	5	6	-	-	-	-
Sidescraper	-	-	-	-	-	-	-	1	2	-	1	-	-
Spokeshave	-	-	-	-	-	-	-	-	-	-	-	2	-
Hafted Spokeshave	-	-	-	-	-	-	-	1?	-	-	-	-	-
Uniface	-	1	-	-	-	-	-	-	-	1	-	-	-
Graver	1	-	-	2	-	-	-	-	2	-	-	-	-
Perforator	-	-	-	-	-	-	2	-	-	-	-	-	-
Chopper	-	1	-	-	-	1	-	-	-	-	-	-	-
MURL	-	6	1	2	-	-	-	35	44	4	4	20	-
Wedge	-	-	1	-	2	-	-	-	1	2	1	5	-
Unifacial Core	-	3	3	-	-	2	-	?	?	-	-	-	-
Bifacial Core	-	5	2	5	-	-	-	?	?	1	-	-	-
Bipolar Core	-	1	3	1	-	-	-	11	12	1	-	1	-
Other Core Varieties***	1	11	2	-	1	1	3	22	30	-	-	9	-
Ground/Pecked Stone Tools													
Hammerstone	-	2	-	-	-	2	-	5	5	-	-	1	1
Anvil	1	-	-	-	-	-	-	1	-	-	-	-	-
Hammer/Anvil Combo	-	2	-	-	-	-	-	-	3	-	-	-	-
Grinding Stone	1?	-	-	1?	-	-	-	-	-	-	-	-	-
Shaft Abrader/Tool Sharpener	-	-	1	-	-	-	-	-	-	-	-	-	-
Features													
Surface Hearth	7	6	2	2	1	3	2	-	3	-	-	-	1
Basin-Shaped Hearth	1	-	-	1	-	-	3	-	-	-	1	1	1
Rock-Filled Pit/Concentration	-	1	-	-	-	-	-	2	-	-	-	1	-
Bone-Filled Pit/Concentration	-	-	-	-	-	-	1	-	1	1	-	-	-
Other Pit Feature	-	1	1	-	-	-	-	-	-	-	-	-	-
Ash Concentration	-	-	-	-	-	-	1	-	-	-	-	-	-
Charcoal Concentration	8	8	2	2	-	-	-	-	-	-	-	-	-
Dwelling Outline?	1	1	-	-	-	-	-	-	-	-	-	-	-
Burial	-	-	-	-	-	-	-	1	-	-	-	-	-
Lithic Reduction	-	-	-	-	-	-	-	-	-	-	1	1	-

RT=Redtail (Ramsay 1993); TH=Thundercloud (Mack 2000); CR=Crown (Quigg 1986); Eg=EgNo-23; Sjov=Sjovold (Dyck and Morlan 1995)
* includes flake points; ** projectile points not attributed to the McKean Series; *** Includes irregular, multi-directional and split pebble cores.

Table C.2. Faunal Assemblages by MNE and MNI (in parentheses) from Select McKean Series Components in Saskatchewan.

	RT11	RT12	RT13(1)	RT13(2)	RT13(3)	RT13(4)	TH5	CR-U	CR-L	Eg-2	Eg-2b	Eg-3	SjovXXI
Scientific Name													
Bison bison	125* (1)	272* (2)	89* (3)	177* (3)	33* (2)	19* (2)	303 (8)	136* (2?)	67* (4)	40 (4)	18 (2)	34 (3)	39 (3)
Alces alces	-	-	-	-	-	-	-	16* (3)	50* (2)	-	-	-	-
Cervus elaphus	-	-	-	-	-	-	-	53* (3?)	8* (2)	-	-	-	-
Ursus sp.	-	-	-	-	-	-	-	1 (1)	-	-	-	-	-
Antilocapra americana	-	-	-	-	-	-	1 (1)	-	-	-	-	-	-
Odocoileus sp.	16* (1)	-	-	-	-	-	-	1 (1)	-	-	-	-	1 (1)
Canis sp	9? (2)	26* (3)	1 (1)	6* (1)	2 (1)	-	47 (2)	-	-	-	-	1 (1)	-
Canis familiaris	-	-	-	-	-	-	-	2 (2)	153* (3)	-	-	-	-
Taxidea taxus	-	-	-	-	-	-	7 (1)	-	-	-	-	-	-
Lynx sp.	-	-	-	-	-	-	1 (1)	-	-	-	-	-	-
Vulpes vulpes	-	1 (1)	-	-	-	-	-	-	-	-	-	-	-
Vulpes sp.	-	-	-	-	-	-	1 (1)	-	-	-	-	-	-
Mephitis mephitis	1 (1)	-	-	-	-	-	2 (1)	-	2 (1)	-	-	-	-
Lepus townsendii	-	1 (1)	-	4 (1)	-	-	-	-	-	-	-	-	-
Lepus americanus	-	-	-	1 (1)	-	-	-	-	-	-	-	-	-
Lepus sp.	-	-	-	-	-	-	4 (1)	2 (1)	31* (3)	-	-	-	-
Sylvilagus nuttalii	-	-	-	-	-	-	20 (2)	-	-	-	-	-	-
Castor canadensis	-	-	-	-	-	-	-	73* (3)	2 (2)	-	-	-	-
Corvus brachyrhynchos	-	-	-	-	-	2 (1)	-	-	-	-	-	-	-
Anas platyrhynchos	-	-	-	-	-	2 (1)	-	-	-	-	-	-	-
Anas cf. *crecca*	-	-	-	-	-	-	1 (1)	-	-	-	-	-	-
Phasianidae	-	-	-	-	-	-	1 (1)	-	1 (1)	-	-	-	-
Mustela vison	-	-	-	1 (1)	-	-	-	-	-	-	-	-	-
Spermophilus richardsonii	? (1)	? (1)	-	-	? (1)	-	-	-	-	-	-	-	-
Spermophilus tridecemlineatus	? (1)	-	-	-	-	-	-	-	-	-	-	-	-
Spermophilus sp.	-	-	-	-	-	-	9 (2)	-	-	-	-	-	-
Thomomys talpoides	-	-	-	? (1)	-	-	1 (1)	-	-	3 (2)	-	1 (1)	-
Cleithrionomys gapperi	-	-	-	? (1)	-	? (1)	2 (2)	-	-	-	-	-	-
Eutamius minimus	? (1)	? (1)	? (1)	-	? (1)	-	-	-	-	-	-	-	-
Lagurus curtatus	-	-	-	-	-	-	1 (1)	-	-	-	-	-	-
Microtus ochrogastor	-	-	-	-	-	? (1)	-	-	-	-	-	-	-
Microtus pennsylvanicus	-	-	-	-	-	-	9 (3)	-	-	-	-	-	3 (1)
Microtus sp.	-	? (1)	-	-	-	-	3 (NA)	-	-	-	-	-	-
Peromyscus maniculatus	-	? (2)	-	-	-	? (1)	23 (1)	-	-	-	-	-	-
Reithrodontomys megalotis	-	? (1)	-	-	-	-	-	-	-	-	-	-	-
Cricetidae Indeterminate	-	-	? (1)	-	-	-	36 (4)	-	-	-	-	-	-
Microsorex hoyi	-	-	-	-	-	-	1 (1)	-	-	-	-	-	-
Passerine	-	-	7 (1)	-	-	-	3 (2)	-	-	-	-	-	-
Unionidae	-	3* (1)	-	-	-	-	1 (1)	26* (?)	30* (?)	-	-	-	-
Catostomas sp.	-	-	-	-	-	-	-	-	7* (1)	-	-	-	-
Osteichthyes indet.	-	3* (1)	-	-	-	-	-	6 (1)	52* (1?)	-	-	-	-
Bufo sp.	-	-	-	-	-	-	1 (1)	-	-	-	-	-	-
Anura indet.	1 (1)	3* (1)	-	4* (1)	-	-	19 (2)	-	-	-	-	-	-

RT=Redtail (Ramsay 1993); TH=Thundercloud (Webster 1999); CR=Crown (Quigg 1986); Eg=EgNo-23; Sjov=Sjovold (Dyck and Morlan 1995)

* These values are NISP; MNE was not presented.

Table C.3. Lithic Tools and Features from Select McKean Components in Alberta.

	CFIII	CFIV	CFV	CFVI	CFVII	CFVIII	CFIX	Saaq 3:5	Saaq 4:1	Saaq 4:2	Saaq 4:3
Formed Lithic Items:											
Hanna	2	2	-	3	-	2	-	3	-	2	3?
Duncan	1	1	1	1	2	5	-	1	-	-	-
McKean Lanceolate	-	1	-	-	-	2	1	3	-	-	-
Other Point Varieties*	-	-	-	-	-	-	-	3	-	-	-
Hafted Biface	-	-	-	-	3	1	-	1	-	-	-
Pointed Biface	-	1	-	1	1	6	-	? 9 total	-	? 2 total	-
Ovate Biface	-	2	-	2	2	3	4	? 9 total	-	? 2 total	-
Irregular Biface	-	1	-	-	-	1	3	? 9 total	-	? 2 total	-
Endscraper - Triangular	-	1	1	3	1	5	5	? 23 total	-	1?	1?
Endscraper - Parallel	-	2	2	-	2	3	-	? 23 total	-	-	-
Endscraper - Ovate	-	-	-	2	-	-	-	? 23 total	-	-	-
Endscraper - Irregular	-	-	-	-	-	-	-	? 23 total	-	-	-
Sidescraper	-	-	-	-	-	-	-	13	-	-	-
Spokeshave	-	1	-	-	-	-	-	-	-	-	-
Hafted Spokeshave	-	1	-	-	-	2	-	-	-	-	-
Uniface	-	-	-	-	-	-	-	1	-	-	-
Graver	-	-	-	-	1	1	1	1	-	-	-
Perforator	-	-	-	-	-	-	-	-	-	-	-
Chopper	3?	2?	-	4?	6?	3?	1?	-	-	-	-
MURL	1	37	6	25	18	54	32	67	-	4	2
Wedge	-	4	1	5	6	35	6	5	-	-	-
Unifacial Core	-	-	-	-	-	-	-	5	-	-	-
Bifacial Core	-	1	1	1	2	15	1	-	-	-	-
Bipolar Core	-	-	-	-	-	-	-	59	-	2	1
Other Core Varieties***	-	5	1	10	-	5	-	16	-	1	-
Ground/Pecked Stone Tools											
Hammerstone	1?	-	1?	-	-	2	7?	-	-	-	-
Anvil	-	-	-	1	-	2	-	-	-	-	-
Hammer/Anvil Combo	-	-	-	-	-	-	-	-	-	-	-
Stone Disc	-	-	1	1	-	-	-	-	-	-	-
Stone Pipe	-	-	-	-	-	1	-	-	-	-	-
Features											
Surface Hearth	5	4	1	2	3	-	-	1	-	-	1
Basin-Shaped Hearth	1	2	-	3	4	4	1	3	-	-	-
Rock-Filled Pit/Concentration	-	-	-	-	-	-	-	-	-	-	-
Bone-Filled Pit/Concentration	-	-	-	-	-	-	-	-	-	-	-
Other Pit Feature	8	-	-	-	1	1	-	-	-	-	-
Ash Concentration	-	-	-	-	5	-	-	-	-	-	-
Charcoal Concentration	-	-	-	-	-	-	-	-	-	-	-
Dwelling Outline?	-	-	-	1	-	1	-	-	-	-	-
Lithic Reduction	-	-	-	-	-	-	-	2	-	-	-

CF=Cactus Flower (Brumley 1975); Saaq=Saahkómaapína (Head et.al. 2003)

* projectile points not attributed to the McKean Series; ** Includes irregular, multi-directional and split pebble cores. Also Brumleys (1975) Heavy Chipped Tools 5 & 6.

Table C.4. Faunal Assemblages by MNE and MNI (in parentheses) from Select McKean Series Components in Alberta.

	CFIII	CFIV	CFV	CFVI	CFVII	CFVIII	CFIX	Saaq 3-5	Saaq 4-1	Saaq 4-2	Saaq 4-3
Scientific Name											
Bison bison	1 (1)	26 (2)	5 (1)	106 (4)	49 (3)	627 (20)	69 (6)	9 (1)	21 (3)	26 (3)	13 (2)
Alces alces	-	-	-	-	-	-	-	-	-	-	-
Cervus elaphus	-	-	-	-	-	-	-	-	-	-	-
Antilocapra americana	-	1 (1)	-	40 (3)	-	13 (1)	2 (1)	-	-	-	-
Odocoileus sp.	-	-	-	3 (1)	-	-	-	-	-	-	-
Canis familiaris	-	1 (1)	-	1? (1)	-	23? (3)	-	-	-	-	-
Taxidea taxus	-	-	-	-	-	-	-	-	-	-	-
Vulpes vulpes	-	-	-	-	-	-	-	-	-	-	-
Vulpes velox	-	-	-	-	-	1 (1)	-	-	-	-	-
Mephitis mephitis	-	-	-	-	-	-	-	-	-	-	-
Lepus townsendii	-	-	-	-	-	-	-	-	-	-	-
Lepus americanus	-	-	-	-	-	-	-	-	-	-	-
Lepus sp.	-	-	-	-	-	1 (1)	-	-	-	-	-
Sylvilagus nuttalii	-	-	-	-	-	1 (1)	1 (1)	-	-	-	-
Leporid Indeterminate	-	-	-	-	1 (1)	-	-	-	-	-	-
Castor canadensis	-	-	-	-	-	-	-	-	-	-	-
Corvus brachyrhynchos	-	-	-	-	-	-	-	-	-	-	-
Anas platyrhynchos	-	-	-	-	-	-	-	-	-	-	-
Anas cf. *crecca*	-	-	-	-	-	-	-	-	-	-	-
Phasianidae	-	-	-	-	-	-	-	-	-	-	-
Quiscalus quiscula?	-	-	-	-	-	1 (1)	-	-	-	-	-
Raptor - small	-	-	1 (1)	-	-	-	-	-	-	-	-
Mustela vison	-	-	-	-	-	-	-	-	-	-	-
Spermophilus richardsonii	-	-	-	-	-	-	-	-	-	-	-
Spermophilus tridecemlineatus	-	-	-	-	-	-	-	-	-	-	-
Thomomys talpoides	-	-	-	-	-	-	-	-	-	-	-
Cleithrionomys gapperi	-	-	-	-	-	-	-	-	-	-	-
Eutamius minimus	-	-	-	-	-	-	-	-	-	-	-
Lagurus curtatus	-	-	-	-	-	-	-	-	-	-	-
Microtus ochrogastor	-	-	-	-	-	-	-	-	-	-	-
Microtus pennsylvanicus	-	-	-	-	-	-	-	-	-	-	-
Peromyscus maniculatus	-	-	-	-	-	-	-	-	-	-	-
Reithrodontomys megalotis	-	-	-	-	-	-	-	-	-	-	-
Cricetidae Indeterminate	-	-	-	-	-	-	-	-	-	-	-
Microsorex hoyi	-	-	-	-	-	-	-	-	-	-	-
Passerine	-	-	1 (1)	-	-	-	-	-	-	-	-
Unionidae	-	1 (1)	-	1 (1)	1 (1)	-	1 (1)	-	-	-	-
Osteichthyes indet.	-	-	-	-	-	1 (1)	-	-	-	-	-
Aves indeterminate	-	-	-	-	1 (1)	-	-	-	-	-	-

CF=Cactus Flower (Brumley 1975); Saaq=Saahkómaapína (Head et.al. 2003)

Table C.5. McKean Series Radiocarbon Dates

Site Name	Area Sampled	Lab Number	Sample	Assoc. Points*	Calc. Age (B.P.)	Norm. Age (B.P.)	Calib 2 s max	Midline** Intercept	Calib 2 s min	Reference
Alberta										
Cactus Flower (EbOp-16)	Occupation III	S-1209	Char	D/H	3740±100	3740±100	4415	4090	3783	Morlan n.d.
	Occupation IV	S-822	Char	M/D/H	3620±95	3620±95	4228	3933[5]	3645	Brumley 1975
	Occupation IV	S-784	Bone	M/D/H	3625±80	3705±80	4409	4119[3]	3890	Brumley 1975
	Occupation VI	S-823	Char	D/H	3615±95	3615±95	4225	3938[3]	3643	Brumley 1975
	Occupation VI	S-820	Bone	D/H	3890±160	3970±160	4848	4419	3932	Brumley 1975
	Occupation VIII	S-782	Char	M/D/H	4130±85	4130±85	4852	4672[5]	4418	Brumley 1975
	Occupation VIII	S-1210	Char	M/D/H	4220±130	4220±130	5213	4828	4418	Morlan n.d.
Saahkomaapina (EeOv-68)	Occupation 4	AECV-2051C	Bone	H?/P.Lake	Unknown	3350±90	3831	3608[5]	3381	Head et.al. 2003
	Occupation 3	AECV-2024C	Bone	H	Unknown	3360±80	3829	3609[5]	3399	Head et.al. 2003
	Occupation 3	AECV-2053C	Bone	H	Unknown	3400±90	3871	3662[3]	3414	Head et.al. 2003
	Occupation 1	AECV-2023C	Bone	H?	Unknown	3650±80	4228	3941[3]	3723	Head et.al. 2003
Saskatchewan										
Billet (EkNv-36)	Area C-2	S-2063	Char	H	3470±120	3470±120	4085	3709[3]	3465	Dyck 1983
	Area C-3	S-2054	Bone	H	3100±60	3180±60	3550	3384	3267	Dyck 1983
Crown (FhNa-86)	Level 3 West	S-2556	Bone	H	3605±120	3685±120	4411	4033[3]	3691	Quigg 1986
	Level 4 East	S-2292	Bone	H	3310±110	3390±110	3902	3636	3381	Quigg 1986
	Level 6 East	S-2291	Bone	H	3425±105	3505±105	4086	3771[7]	3476	Quigg 1986
	Level 6 East	S-2554	Bone	H	3600±80	3680±80	4242	4032[3]	3734	Quigg 1986
	Level 7 West	S-2519	Char	None	3965±95	3965±95	4810	4418	4103	Quigg 1986
	Level 8 East	S-2526	Bone	M	3995±95	4075±95	4836	4553[3]	4297	Quigg 1986
	East	S-2521	Bone	M	3825±75	3905±75	4527	4347[5]	4093	Quigg 1986
	East	S-2369	Bone	M	3825±90	3905±90	4570	4347[5]	4024	Quigg 1986
	West	S-2290	Bone	M	4180±115	4260±115	5261	4833	4449	Quigg 1986
	West	S-2525	Bone	M	4295±85	4375±85	5297	4922[3]	4826	Quigg 1986
	East	S-2520	Bone	M	4330±115	4410±115	5440	5007[3]	4660	Quigg 1986
Graham (FaNq-30)	Burial	S-1574	Bone	D	3245±50	3340±50	3691	3606[3]	3465	Walker 1984
Long Creek (DgMr-1)	Level 5	S-63a	Char	H	3370±145	3370±145	3980	3610[5]	3270	Wettlaufer & Mayer-Oakes 1960
	Level 5	BGS-2362	Bone	H	3775±55	3856±55	4420	4250	4091	New Date
Mortlach (EcNl-1)	Level 8	S-2	Bone	D-H	3400±200	3480±200	4348	3774[3]	3271	Wettlaufer 1955
Sjovold (EiNs-4)	Layer XXI	S-2062	Bone	H	3530±115	3610±115	4241	3899	3615	Dyck and Morlan 1995

Table C.5. McKean Series Radiocarbon Dates (Continued)

Site Name	Area Sampled	Lab Number	Sample	Assoc. Points*	Calc. Age (B.P.)	Norm. Age (B.P.)	Calib 2 s max	Midline** Intercept	Calib 2 s min	Reference
Saskatchewan Continued										
Redtail (FbNp-10)	Level 11	S-3372	Bone	H	3480±80	3580±80	4091	3869	3642	Ramsay 1993
	Level 12 (1)	S-3373	Bone	H	3470±80	3570±80	4089	3851[3]	3640	Ramsay 1993
	Level 12 (2)	S-3008	Bone	H	3660±75	3740±75	4352	4090	3873	Ramsay 1993
	Level 13 (2)	S-3374	Bone	M/D?	3860±70	3965±70	4778	4418	4163	Ramsay 1993
	Level 13 (2)	S-3375	Bone	M/D?	3880±70	3980±70	4785	4421	4240	Ramsay 1993
	Level 13 (4)	S-3009	Bone	M	4280±80	4360±80	5285	4870	4826	Ramsay 1993
Thundercloud (FbNp-25)	Level 5a	BGS-2369	Bone	D/H	3150±50	3172±50	3472	3381	3267	New Date
	Level 5b	NZA-15749	Bone	D/H	Unknown	3382±55	3824	3634	3472	Leyden 2004
	Level 5b	BGS-2367	Bone	D/H	3315±50	3375±50	3808	3610[5]	3471	New Date
	Level 5c	S-3645	Bone	M	4040±90	4145±90	4865	4715[5]	4419	Webster 1999
Cut Arm (FbNp-22)	Occ 8 Upper	BGS-2383	Bone	M	3387±50	3441±50	3832	3690	3570	New Date
	Occ 8 Lower	BGS-2384	Bone	M	3448±60	3520±60	3975	3778[5]	3638	New Date
Un-named (EgNo-23)	Occupation 2a	BGS-2363	Bone	H	3348±50	3427±50	3830	3662[3]	3565	New Date
	Occupation 2b	Beta-167310	Bone	H	3430±40	3520±40	3894	3772[5]	3652	New Date
	Level 2	BGS-2364	Bone	H	3440±55	3537±55	3977	3799[3]	3644	New Date
	Occupation 3	Beta-183521	Bone	M	4140±60	4240±60	4872	4831	4575	New Date
	Bone Bed	BGS-2366	Bone	M	3540±50	3620±50	4086	3933[5]	3733	New Date
	Bone Bed	BGS-2386	Bone	M	3530±50	3613±50	4085	3937[3]	3730	New Date
Manitoba										
The Pas (FlMh-2)	Lowest Level	A-1369	Char	D-H	3190±60	3190±60	3553	3420[3]	3268	Quigg 1986
Whitemouth Falls (EaLa-1)	Component 2	GX-4415	Bone	M	3405±175	3485±175	4239	3766[5]	3360	Morlan n.d.
North Dakota										
Mondrian Tree (32MZ58)	Area A - Zone 7	UCR-1324	Char	D	3550±85	3550±85	4087	3833	3614	Toom 1983
	Area A - Zone 7	UCR-1326	Char	D	3560±170	3560±170	4406	3835	3414	Toom 1983
	Area A - Zone 7	UCR-1325	Char	D	3580±170	3580±170	4410	3869	3467	Toom 1983
	Area A - Zone 7	UCR-1323	Char	D	3745±170	3745±170	4569	4119[3]	3640	Toom 1983
	Area A - Zone 7	UCR-1322	Char	D	4030±100	4030±100	4830	4477[3]	4186	Toom 1983
	Area A - Zone 8	UCR-1328	Char	None	4010±160	4010±160	4866	4479[3]	3989	Toom 1983
Red Fox (32BO213)	Level 4	SI-479	Char	D	3770±90	3770±90	4417	4118[3]	3873	Syms 1969

Table C.5. McKean Series Radiocarbon Dates (Continued)

Site Name	Area Sampled	Lab Number	Sample	Assoc. Points*	Calc. Age (B.P.)	Norm. Age (B.P.)	Calib 2 s max	Midline** Intercept	Calib 2 s min	Reference
South Dakota										
Gant (39ME9)	Unit III	Unknown	Char	Mixed	4130±130	4130±130	4968	4672[5]	4262	Gant and Hurt, Jr. 1965
George Hey (39FA302)	Feature 6	WIS-1086	Char	M/D	3520±70	3520±70	3981	3772[5]	3614	Keyser 1986
	Feature 9	WIS-1085	Char	M/D	3925±65	3925±65	4527	4410	4152	Tratebas 1998
Kolterman (39FA68)	Component B	M-368	Char	M	3630±175	3630±175	4222	3949[3]	3473	Wheeler 1995
	Component B	M-369	Char	M	4230±175	4230±175	5308	4829	4296	Wheeler 1995
Lightning Spring (39HN204)	Stratum 8	TX-4084	Char	D	3430±270	3430±270	4420	3662[3]	2997	Keyser 1985
	Stratum 9	TX-4083	Char	D	4190±110	4190±110	5028	4768[3]	4420	Keyser 1985
	Stratum 10	TX-4081	Char	D	3850±150	3850±150	4808	4244	3833	Keyser 1985
	Stratum 10	TX-4082	Char	D	3870±210	3870±210	4848	4300[5]	3692	Keyser 1985
	Stratum 12	Beta-58280	Char	D	4040±90	4040±90	4829	4478[3]	4253	Keyser and Wettstaed 1995
	Stratum 14	Beta-58279	Char	D	4200±170	4200±170	5295	4825	4254	Keyser and Wettstaed 1995
Beaver Creek (39CU779)	Unit 11	Beta-13827	Char	M	3870±70	3870±70	4508	4300[5]	4088	Martin et.al. 1993
	Unit 12	Beta-19059	Char	None	3940±170	3940±170	4844	4413	3892	Martin et.al. 1993
	Unit 13	Beta-19060	Char	M	4010±100	4010±100	4828	4479[3]	4155	Martin et.al. 1993
	Unit 14 (top)	Beta-19061	Char	M?	4710±110	4710±110	5653	5382[3]	5053	Martin et.al. 1993
Montana										
Un-named (24RB1164)	Locus T4-2L	Beta-35225	Char	D/H	3310±90	3310±90	3818	3514[3]	3359	Munson 1992
Sorenson (24CB202)	Occupation V	I-691	Char	Mixed	4900±250	4900±250	6267	5609	4971	Husted 1991
Benson's Butte (24BH1726)	Mid.Archaic Leve	Tx-2797	Char	Mixed	4230±50	4230±50	4865	4829	4589	Fredlund 1979
Rigler Bluff's (24PA401)	Unknown	W-1135	Char	Stemmed	4900±300	4900±300	6293	5609	4852	Syms 1969; Frison 1991
	Unknown	Grey No. 29	Char	Stemmed	5040±150	5040±150	6172	5807[3]	5473	Syms 1969; Frison 1991
Wyoming										
Bottleneck Cave (48BH206)	Occupation IV	SI-239	Char	Mixed	3820±200	3820±200	4829	4188[5]	3643	Husted 1991; Syms 1969
Dead Indian Creek (48PA551)	Area 1	RL-321	Char	Mixed	3800±110	3800±110	4515	4185[5]	3869	Frison and Walker 1984
	Area 1	W-2597	Char	Mixed	4180±250	4180±250	5451	4722[7]	3986	Frison and Walker 1984
	Area 1	W-2599	Char	Mixed	4430±250	4430±250	5653	5009[3]	4412	Frison and Walker 1984
Leigh Cave (48WA304)	Level 1	Grey 25	Char	D/H	4170±150	4170±150	5209	4721[7]	4262	Frison and Huseas 1968
McKean (48CK7)	Housepit Hearth	RL-1860	Char	M/D/H	3790±140	3790±140	4567	4151	3731	Kornfeld 1995;
	Locality II	RL-1861	Char	M/D/H	4590±160	4590±160	5641	5309	4837	Kornfeld and Frison 1985
Cordero (48CA75)	Area 1	RL-805	Char	D-H	3520±150	3520±150	4233	3772[5]	3414	Reher et.al. 1985

Table C.5. McKean Series Radiocarbon Dates (Continued)

Site Name	Area Sampled	Lab Number	Sample	Assoc. Points*	Calc. Age (B.P.)	Norm. Age (B.P.)	Calib 2 s max	Midline** Intercept	Calib 2 s min	Reference
Wyoming Continued										
Mummy Cave (48PA201)	Level 30	I-1580	Char	M/D/H	4090±140	4090±140	4956	4548[3]	4155	Husted and Edgar 2002
	Level 30	I-1581	Char	M/D/H	4170±140	4170±140	5046	4722[7]	4299	Husted and Edgar 2002
	Level 30	I-1034	Char	M/D/H	4375±180	4375±180	5570	4936[3]	4446	Husted and Edgar 2002
	Level 30	I-1428	Char	M/D/H	4420±150	4420±150	5469	5008[3]	4575	Husted 1995
Scoggin (48CR304)	Level 1	RL-174	Char	M/Mal	4540±110	4540±110	5578	5294	4861	Lobdell 1974
Sweem-Taylor (48JO301)	Level IV	Grey-30	Char	Mixed	4960±180	4960±180	6170	5659	5313	Syms 1969
Red Canyon Rockshelter	Component IIB	Unknown	Char	H	3260±80	3260±80	3687	3469	3274	Tratebas 1998
	Component II	Unknown	Char	M/H	4440±60	4440±60	5302	5013[3]	4860	Tratebas 1998
	Component II	Unknown	Char	M/H	4550±130	4550±130	5588	5297	4847	Tratebas 1998
Grey-Taylor (48JO303)	Unknown	A-483	Char	Mixed	3450±40	3450±40	3830	3692	3590	Syms 1969; Frison 1991
	Unknown	A-485	Char	Mixed	3980±70	3980±70	4785	4421	4240	Syms 1969; Frison 1991
Med. Lodge Creek (48BH499)	Unknown	RL-98	Char	Mixed	3980±160	3980±160	4852	4421	3934	Frison 1991; Ramsay 1993
	Unknown	RL-438	Char	Mixed	4050±150	4050±150	4870	4478[3]	4092	Frison 1991; Ramsay 1993
Southsider Cave (48BH364)	Unknown	RL-668	Char	M	3900±140	3900±140	4816	4360[7]	3910	Frison 1991; Ramsay 1993
	Unknown	RL-672	Char	M	4170±150	4170±150	5209	4721[7]	4262	Frison 1991; Ramsay 1993
Granite Creek (48BH330)	Unknown	RL-389	Char	Mixed?	4700±130	4700±130	5660	5385[3]	4992	Frison 1991; Ramsay 1993
Hawken II (48CK303)	Unknown	RL-470	Bone	Mixed?	4250±140	4330±140	5316	4865	4454	Frison 1991
Paint Rock V (48BH349)	Unknown	RL-482	Char	M/D/H	4310±140	4310±140	5311	4855	4449	Frison 1991
Colorado										
Dipper Gap (5LO101)	Level D Top	UGA-456	Char	D/H	3180±90	3180±90	3632	3384	3169	Metcalf 1974
	Level D Middle	UGA-453	Char	D/H	3410±90	3410±90	3889	3663[3]	3465	Metcalf 1974
	Level D Bottom	UGA-455	Char	D/H	3520±85	3520±85	4074	3772[5]	3575	Metcalf 1974
Kinney Spring (5LR144c)	Level 26	Beta-7330	Char	M Series	3110±130	3110±130	3633	3350	2952	Morris et.al. 1985
	Bank	Beta-6847	Char	M Series	3250±80	3250±80	3685	3468	3272	Morris et.al. 1985
	Level 87-97	Beta-7333	Char	M Series	3800±70	3800±70	4415	4185[5]	3934	Morris et.al. 1985
Pack Rat Rockshelter (5LR170)	11S13W	Beta-2285	Char	M/D/H	2440±80	2440±80	2748	2396[7]	2333	Morris et.al. 1985
	11S13W	Beta-2288	Char	M/D/H	2480±90	2480±90	2764	2586[7]	2339	Morris et.al. 1985
	11S13W	Beta-2286	Char	M/D/H	2760±100	2760±100	3160	2851	2738	Morris et.al. 1985
Phoebe Rockshelter (5LR161)	Level 3	Beta-3869	Char	D/H	3570±60	3570±60	4075	3851[3]	3692	Morris et.al. 1985
	Level 3	Beta-3870	Char	D/H	3890±60	3890±60	4508	4325[3]	4098	Morris et.al. 1985

Table C.5. McKean Series Radiocarbon Dates (Continued)

Site Name	Area Sampled	Lab Number	Sample	Assoc. Points*	Calc. Age (B.P.)	Norm. Age (B.P.)	Calib 2 s max	Midline** Intercept	Calib 2 s min	Reference
Colorado Continued										
Spring Gulch (5LR252)	Level 4	UGA-671	Char	M/D/H/Mal	2830±135	2830±135	3343	2936[3]	2738	Morris et.al. 1985
	Level 4	UGA-672	Char	M/D/H/Mal	3095±75	3095±75	3469	3296[3]	3079	Morris et.al. 1985
	Level 4 Bottom	UGA-1048	Char	M/D/H/Mal	3855±350	3855±350	5300	4249	3377	Morris et.al. 1985
	Level 5	UGA-1047	Char	M/D/H/Mal	3700±105	3700±105	4408	4034[3]	3724	Morris et.al. 1985
LoDaisKa (5JF142)	Complex C	M-1006	Char	M/D?	3150±100	3150±100	3630	3369[3]	3080	Husted 1991; Cassells 1997
	Complex C	M-1004	Char	M/D?	3400±100	3400±100	3894	3673[3]	3399	Husted 1991; Cassells 1997
Nebraska										
Signal Butte (25SF1)	IC	L-385D	Char	M/H	4170±250	4170±250	5449	4721[7]	3983	Forbis 1985
	IA	L-385B	Char	M/H/Mal	4550±220	4550±220	5722	5297	4573	Forbis 1985

* M=McKean Lanceolate; D=Duncan; H=Hanna; Mal=Mallory; Mixed=includes points not presently included in the McKean series; D-H refers to stemmed points not classified by the author.

** Superscript refers to the number of intercepts (calibrated source Stuiver and Reimer 2000, CALIB 4.3).